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THE PHILIPPINE AGRICULTURIST

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BIENVENIDO MARIA GONZALEZ

WHEREAS, In the death of Bienvenido Maria Gonzalez the country lost a leading educator, devoted scientist, able administrator, and model citizen and head of the family; and

WHEREAS, During his incumbency as Dean of the College of Agriculture, the first Filipino to hold that position, and as President of the University of the Philippines, the first alumnus and youngest incumbent to occupy that office, he carried his duties and responsibilities with vision, firmness, good judgment, and high idealism; and

WHEREAS, As an educator and administrator he raised the standard of the University to a high plane and endeared himself to his colleagues and students by his stout championship of academic rights and freedom; and

WHEREAS, Through his creative scholarship and scientific leadership he lent distinction to his Alma Mater and to his country; and

WHEREAS, He was a loyal and inspiring friend and a devoted husband and father; now, therefore be it

Resolved, That the faculty of the College of Agriculture of the University of the Philippines express their feeling of grievous loss and extend to his widow and children their sincere expression of sympathy; and be it further

Resolved, That copies of these resolutions be sent to his family, that they be spread in the minutes of the faculty of the College of Agriculture and sent to the archives of the University, and that they be published in THE PHILIPPINE AGRICULTURIST.

N. G. DUNGLAO
N. J. CRUZ
G. O. OCFEMIA
Committee

[THE PHILIPPINE AGRICULTURIST, Vol. 37, No. 7, December, 1953, appeared in October, 1954.]
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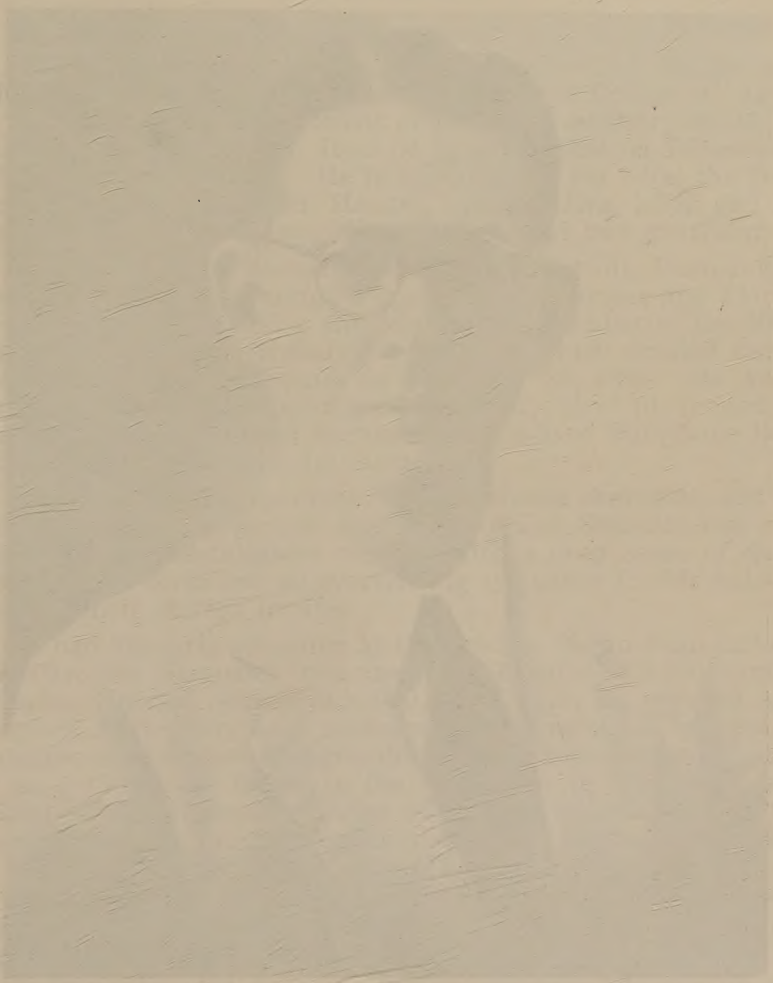


Bienvenido Maria Gonzalez

BIENVENIDO MARIA GONZALEZ: 1893-1953

VALENTE VILLEGAS [1]

WITH ONE PORTRAIT

Bienvenido Maria Gonzalez, former President of the University of the Philippines and at one time Dean of the College of Agriculture and Head of the Department of Animal Husbandry of the same institution, died at the San Juan de Dios Hospital on December 30, 1953, at the age of sixty. He is survived by his wife, the former Concepcion Rafols, children, Manuel, Gonzalo, Eva, Lilia, and Bienvenido, Jr., daughter-in-law, Ester Mapua, and two grandsons.

Bienvenido Maria Gonzalez was born in Apalit, Pampanga, on March 22, 1893. His parents were Joaquin Gonzalez and Florencia Sioco. Joaquin Gonzalez, a physician, was a member of the Malolos Congress of the Revolutionary Government which drafted the first constitution of the Philippines on November 29, 1898. He was the President of the first state university, namely, the Universidad Literaria de Filipinas, founded during the short-lived Philippine Republic under General Emilio Aguinaldo.

A man of sterling qualities, unimpeachable character, and firmness and loyalty to principle, Bienvenido Maria Gonzalez was a gentleman and an indefatigable worker, with a deep sense of duty to the land of his birth and an overflowing sympathy for his fellowmen whatever their station in life.

He had his early schooling at the Colegio de San Juan de Letran (1902-05), the Sampaloc Intermediate School (1905-08), and the Philippine Normal School (1908-10). In 1910, he enrolled at the College of Agriculture as a sophomore and graduated in 1913 with the degree of Bachelor of Agriculture. The following year, he was sent as a university fellow to the University of Wisconsin, where he obtained the degree of Master of Science in 1915, having taken advanced work in animal genetics under Dr. Leon J. Cole. After a few years' stay in Los Baños, he was again sent abroad as a university fellow in 1921, this time to Johns Hopkins University, where he worked under Dr. Raymond Pearl and received the degree of Doctor of Science in 1923.

Dr. Gonzalez rose from the bottom, working his way up to the presidency of the University of the Philippines step by step. Starting as Assistant in Animal Husbandry on December 13, 1913, he became Instructor in Animal Husbandry on June 12, 1916; Assistant Professor of Animal Husbandry on June 1, 1917; Associate Professor of Animal Husbandry on January 1, 1919; Professor of Animal

[1] General Contribution No. 867.

Husbandry on January 1, 1920; Head of the Department of Animal Husbandry on October 6, 1923; Acting Dean of the College of Agriculture on August 27, 1927; and President of the University of the Philippines on April 29, 1939. This last position he held, except for some years during the Japanese Occupation, until his retirement on April 22, 1951.

Besides being the first alumnus and the first scientist to become president of the University of the Philippines, Dr. Bienvenido Maria Gonzalez also had the distinction of being the youngest president of the University and of being its first alumnus regent, serving in that capacity from 1918-1921. He also served in various other positions as follows: Special Agent, Bureau of Non-Christian Tribes, 1921-22; first President of the Los Baños Biological Club, of which he was co-founder, 1923-1925; President, Maquiling School, 1924-40; Secretary of the Seventh Philippine Agricultural Congress, 1926: Director of the Pampanga Sugar Development Company, 1927; Editor of *The Philippine Agriculturist*, June, 1929, to March, 1939; first President of the University Chapter of the Honor Society of Phi Kappa Phi, 1933; President of the Philippine Society of Technical Agriculturists, 1931-33; Fellow of the American Association for the Advancement of Science, 1934; Vice-Chairman of the National Research Council of the Philippines, 1934-35 and 1937; Chairman of the National Research Council of the Philippines, 1938-51; Director of the National Development Company, 1934-36; President of the Society for the Advancement of Research, 1935-36; Member of the National Economic Council, 1938-41; Member at Large of the National Executive Board, Boy Scouts of the Philippines, 1939; Director and Chairman of the Board, Agricultural and Industrial Bank, 1945 to 1946; Chairman, National Housing Commission, 1945-50; Chairman, Advisory Board, Philippine War Relief of the United States of America, 1945-51; Director, National Commission on Education, Science and Cultural Matters, 1948-51; Member, Inauguration Committee of the Philippine Republic, 1946; Member, Philippine Government Enterprises Council, 1948-51; Member, American Educational Foundation (Philippines), 1948-51; Chairman, National Urban Planning Commission, 1946-48; Chairman, Institute of Science, 1948-51; President, Pampanga Sugar Development Company, 1951-53.

Dr. Gonzalez was listed in *American Men of Science*, fifth edition, 1933, and sixth edition, 1938; *Who's Who in America*, 1942; *Who's Who in American Education*, 1949-50; and *Leaders in Education* (U.S.), third edition, 1948.

The administration of Dr. Bienvenido Maria Gonzalez as president was one of unusual progress for the University of the Philippines, not only in the way of physical improvements, but particularly in the nature of instruction and faculty membership, student material, advanced studies, and research. He devoted all his energies towards building up and maintaining an institution recognized for

its leadership in the Far East and respected abroad. His watchword as university president was "to set high standards in the acquisition and interpretation of knowledge so the pronouncements of the faculty on any subject will be authoritative."

To Dr. Gonzalez belongs the credit for the transfer of the University of the Philippines to its present site in Diliman, Quezon City. During his administration, the University saw unprecedented growth in its physical plant, with the construction at the Diliman campus of the College of Law Building, the College of Education Building, the College of Liberal Arts Building, the College of Engineering Building, the Administrative Building, the Library Building, the Men's and Women's Dormitories, and the Carillon Building. On his shoulders fell the task of reopening the University of the Philippines after Liberation, gathering its faculty, and rehabilitating it from the ravages of war.

From 1913 to 1928, Dr. Gonzalez devoted himself to building up the Department of Animal Husbandry of the College of Agriculture. As an agriculturist specializing in animal genetics and improvement of Philippine livestock, he early saw the futility of pursuing the old, costly, and wasteful practice of bringing into the Philippines standard breeds of livestock of temperate countries. In 1916, he initiated the development of the Berkjala breed of swine and the Los Baños Cantonese chicken. Four years later, he established the beginnings of the Philamin breed of beef-draft cattle. Both the Berkjala swine and the Los Baños Cantonese chicken have long been established as improved breeds. The Los Baños Cantonese chicken was exterminated during World War II, but work to rehabilitate the breed has been resumed.

While Dr. Gonzalez was Head of the Department of Animal Husbandry, he devoted much time to research. His published scientific and popular papers follow:

1919. Foot-and-mouth disease at the College of Agriculture. Philippine Agriculturist 8: 77–78.

1919. The gestation of the carabao. Jour. Heredity 16: 374–375. *Pl. 1.*

1920. Practical work in animal husbandry. Philippine Agriculturist 9: 57–58.

1920. Range cattle management. Philippine Agriculturist 9: 59–63.

1920. La ganaderia en Filipinas. Anuario del V. Congreso Agricola de Filipinas: 156–162.

1922. Hog cholera at the College of Agriculture. Philippine Agriculturist 10: 347–348.

1923. Experimental studies on the duration of life. VII. The Mendelian inheritance of duration of life in crosses of wild type and quintuple stocks of *Drosophila melanogaster*. The American Naturalist 57: 153–192. (With R. Pearl and S. L. Parker).

1923. Experimental studies on the duration of life. VIII. The influence upon duration of life of certain mutant genes of *Drosophila melanogaster*. The American Naturalist 57: 289–325.

1923. Here and there among agricultural colleges in Europe. Philippine Agriculturist **12**: 173–179.

1923. Improving Philippine swine. I. Philippine Agriculturist **12**: 251–256. (With F. P. Lago).

March 18, 1924. Address to the graduates. University of the Philippines commencement, 1924. Philippine Collegian.

1924. Hog raising for beginners. Philippine Agriculturist **12**: 445–452.

1924. Selecting farm animals. Jour. Heredity **15**: 261–262.

Dec. 6, 1924. Lechon. Philippines Free Press: 26–27. (With F. P. Lago).

1925. Conversion tables for common Philippine weights and measures including metric and English equivalents. Experiment Station, College of Agriculture, Los Baños Circular 6. (With A. T. Taleon).

1925. Our beef supply. Philippine Agriculturist **14**: 131–134.

1925. Recent trip to Darwin, Australia. Philippine Agriculturist **14**: 247–249.

1926. Fences for farm animals. Philippine Agriculturist **14**: 479–490. (With J. P. Esguerra).

1926. Weighing large farm animals on a portable scale. Philippine Agriculturist **15**: 149–157.

1926. Observation on the duration of service and serviceable life of work cattle. Philippine Agriculturist **15**: 251–256.

1927. Developing the Cantonese chicken. Philippine Agriculturist **15**: 481–485. (With F. M. Fronda).

1927. Education and agricultural promotion in Japan: I. The Third Pan-Pacific Science Congress. Philippine Agriculturist **15**: 517–522.

1927. Education and agricultural promotion in Japan: II. Japan's system of education. Philippine Agriculturist **15**: 571–577.

1927. Education and agricultural promotion in Japan: III. Research work. Philippine Agriculturist **16**: 3–8.

1927. Education and agricultural promotion in Japan: IV. Promotion of agriculture. Philippine Agriculturist **16**: 67–71.

1927. Education and agricultural promotion in Japan: V. Stock raising. Philippine Agriculturist **16**: 281–295.

1927. Is a Zebu-carabao hybrid possible? Jour. Heredity **18** (12): 544–547. (With J. P. Esguerra).

1928. "Bighead" of horses a heritable disease. Jour. Heredity **19** (4): 159–167. (With V. Villegas).

1929. The Nagoya, a new immigrant from Japan. Philippine Agriculturist **17**: 559–563. (With F. M. Fronda).

1926. Experience in the Philippines with the introduction of purebred animals to improve the common stock. Proceedings of the Third Pan-Pacific Congress, Tokyo, 1926: 1142–1150.

1932. The animal improvement program of the College of Agriculture. Philippine Agriculturist **21**: 1–8.

1935. On research. Philippine Agriculturist **22**: 1–12.

1935. Studies on surra: II. Natural recovery from surra infection among oxen and water buffaloes. Philippine Agriculturist **23**: 859–879. (With M. Manresa).

1935. Experiments on surra. American Veterinary Medical Association **87**: 32–36. (With M. Manresa).

1936. Studies on surra: IV. Variability in size of the trypanosomes and density of infection, natural and acquired immunity. Philippine Agriculturist **24**: 716–731. (With M. Manresa).

1936. In memoriam: Aniceto B. Ascalon. Philippine Agriculturist **24**: 883–884.

1936. Published contributions from the College of Agriculture: XIII. Philippine Agriculturist **24**: 888–897.

1936. Looking into the future. Philippine Agriculturist **25**: 3–4.

1937. Science and man power. Philippine Agriculturist **25**: 717–719.

1938. Problems of adjustment in Philippine animal industries. National Research Council Bulletin 17: 1–7. (With F. M. Fronda).

1939. Teaching and research in the University. Philippine Agriculturist **27**: 783–785.

1939. Published contributions of the College of Agriculture: XVI. Philippine Agriculturist **27**: 855–865.

As President of the University of the Philippines, Dr. Gonzalez contributed the following articles to technical and popular periodicals:

Human Progress and the Scientist. The Monday Mail, March 27, 1939.

What is a Filipino? The Sunday Tribune Magazine, October 29, 1939.

The Philippines Assimilates the World. Philippine Yearbook, November, 1939. (With G. W. Gonzalez).

A Democracy for the Philippines. Philippines Free Press, September 6, 1941.

A Bachelor's Degree at the Bargain Counter. Philippines Free Press, September 20, 1941.

Let Reason Prevail. Philippines Free Press, October 4, 1941.

After this War, What of the Philippines? Philippines Free Press, December 13, 1941.

Youth and Education. Education and Health Monthly, October, 1945.

Some Philippine Educational Problems. The Teachers Journal, May, 1946.

A Reorientation in Woman's Education. Philippine Journal of Education, October, 1946.

The Man in the Family. The Evening News, August 23, 1947.

U. P.—Maker of National Leaders. The Newspaperman, November, 1947.

What are the Outstanding Problems of the University Now? Philippine Collegian, January, 1948.

Blueprint for a Greater U. P. Philippine Collegian, August 16, 1948.

On Higher Education. U. P. Iloilo College Monthly, March-April, 1949.

EUSTALODES ANTHIVORA (GELECHIIDAE, LEPIDOPTERA), A NEW PEST OF ACHRAS SAPOTA IN THE PHILIPPINES [1]

J. F. Gates Clarke [2]

WITH ONE PLATE

The moth described below was received from Dr. S. M. Cendaña, College of Agriculture, University of the Philippines, College, Laguna, with the request that it be named so that a student could publish on its life history. The species is the second recorded one of the genus and the first for which the biology is known. The host is important for its fruit and as a source of nectar, the production of the latter being greatly reduced by the attacks of the larvae of the moth upon the flowers. The life history will be published by the collector, Miss Maria Salome E. del Rosario.

Drawings for this paper were made by the author.

Genus EUSTALODES Meyrick

Eustalodes Meyrick, Insects of Samoa. Part III, Lepidoptera, fasc. 2, p. 82, 1927.

The genus *Eustalodes* was proposed by Meyrick for *E. oenosema* Meyrick, the only included species. The description was based on a male and a female from Opolu, Malololelei, 2000 ft. (June). An examination of the type male and the female revealed that veins 4 and 5 of forewing are closely approximate, not ". . . 4 and 5 short-stalked . . ." as stated by Meyrick. The discocellular vein is oblique and very weak, and, in an undenuded wing such as Meyrick had, veins 4 and 5 appear stalked and connate with 3.

The species described below satisfies all the generic characters set forth by Meyrick, except the stalking of veins 4 and 5, and agrees in venation with his type specimens. Therefore, the assignment of the species to *Eustalodes* is correct, and it becomes the second of this interesting genus.

EUSTALODES ANTHIVORA, sp. nov.

PLATE I, FIGURES 1-1e

Alar expanse, 11-13 mm.

Labial palpus cinereous; in male the lower two-thirds dark fuscous shading to dark slate and second segment with expandable whitish scale-tuft inwardly; in female second segment mixed with

[1] Miscellaneous Contribution No. 28.

[2] Of the Entomology Research Branch, Agricultural Research Service, United States Department of Agriculture.

blackish fuscous and third segment with median band of the same color. Antenna pale cinereous, weakly annulated, and sometimes dusted with scattered, fuscous scales. Head, thorax, and ground color of forewing cinereous. Head and thorax with some blackish dusting and the latter with some black scaling posteriorly; forewing with four or five narrow, broken, longitudinal black lines, more or less following the fold and veins, the middle pair extending from near base of wing to tornus and apex; costa edged with light fuscous from basal third to near apex, this color broken by four or five short, oblique dashes of the ground color; cilia yellowish gray with darker gray suffusion apically; costa thickened in both sexes; in male, central portion of underside covered with sooty-black sex-scaling and from near base of wing a strong, dark-gray tuft of long hairlike scales; a similar, but less dense tuft of black scales from center of cell; vein (Pl. I., fig. 1) with a conspicuous, glandular, oval patch. Hind wing gray, subhyaline basally; in male (Pl. I, fig. 1a) the hyaline area and the costal development accentuated; from upper surface of basal area, in male, a group of longitudinal, black, long, hairlike scales; cilia yellowish gray. Legs sordid ocherous-white suffused and banded with fuscous. Abdomen grayish, suffused with fuscous above, sordid ocherous-white beneath.

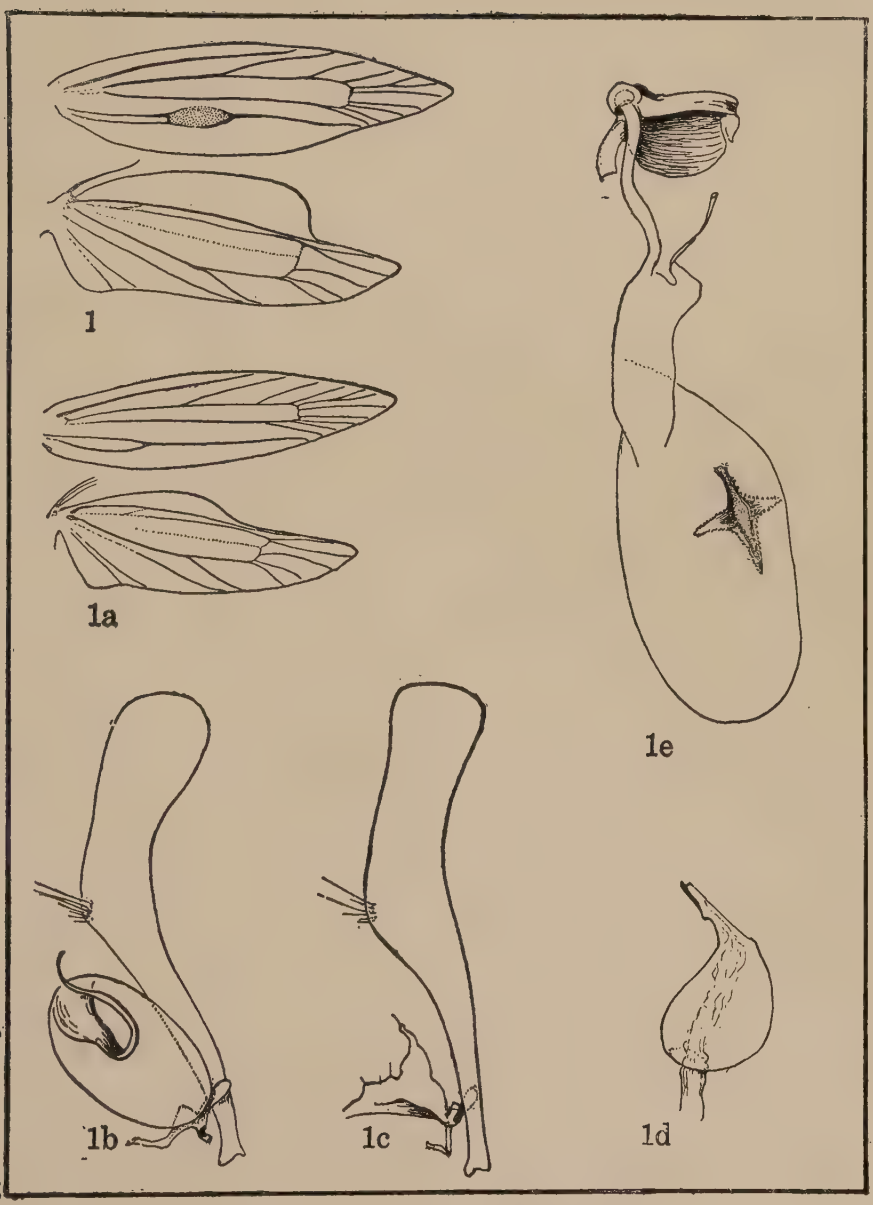
Male genitalia. Uncus nearly as long as vinculum. Gnathos a large, strong hook. Harpes asymmetrical, the left with a large oval ventral process emitting a long recurved process (Pl. I, fig. 1b); ventral process of right harpe weakly developed (Pl. I, fig. 1c); aedeagus as figured (Pl. I, fig. 1d).

Female genitalia. Asymmetrical, the ostium opening on the left side. Signum a large, four-pointed plate (Pl. I., fig. 1e).

Type. U. S. N. M. No. 62284. Mt. Maquiling, Philippines.

Remarks. Described from the male type and 19 male and female paratypes, all from the same locality (February, June, and August dates). Paratypes in the U.S. National Museum, British Museum (Natural History), and the collection of the College of Agriculture, University of the Philippines, College, Laguna.

This species differs from *oenosema* in that it has no pink coloration and no triangular costal spot of forewing.



CLARKE: EUSTALODES ANTHIVORA SP. NOV.

BIONOMICS OF EUSTALODES ANTHIVORA CLARKE, GELECHIIDAE, LEPIDOPTERA [1]

MARIA SALOME E. DEL ROSARIO AND S. M. CENDAÑA

WITH ONE PLATE AND ONE TEXT FIGURE

Eustalodes anthivora Clarke feeds on the floral organs of chico, *Achras sapota* L., and causes the flowers to fall, thus interfering with the setting of fruits. The infestation on all varieties was 59 to 80 per cent from December to June, when the trees were in heaviest bloom and precipitation was low, but it diminished to 27 per cent during the rainy months.

The incubation period is from 3 to 4 days; the larval period, from 9 to 15 days; and the pupal period, 5 days. The larva passes through six instars. The first larval molt usually occurs 2 or 3 days after hatching; the second molt, 1 or 2 days after the first; the third, 2 days after the second; the fourth, 2 or 3 days after the third; the fifth, 1 or 2 days after the fourth; and the sixth (pupation), almost invariably 1 day after the fifth. The eggs are laid at night, singly or in groups of 2 to 5 on the peduncles of the flowers or on the leaf petioles.

A number of natural enemies of the insect were observed: a crab spider fed on the adults, another spider fed on the caterpillars, a chalcid wasp was a larval-pupal parasite, and a braconid wasp was a larval parasite. DDT (0.13 per cent), methoxychlor (0.15 per cent), and dieldrin (0.024 per cent) sprays proved effective in killing the larvae in the flowers and in preventing successful invasion of healthy flowers by the larvae. Trees that were sprayed with these insecticides had a fruit set of 48 per cent or better.

Gonzalez and Feliciano [2] reported the occurrence of a gelechiid moth on blossoms of chico, *Achras sapota* Linn. The larva bores into and feeds on the young ovaries, causing the flowers to fall off. Infested trees develop very few fruits because of the injury to the flowers. The pest turned out to be a new species, which Dr. F. F. Gates Clarke [3] describes as *Eustalodes anthivora.*

The present work inquired into (1) the life history of the insect and (2) the possible means of controlling it. The studies were conducted in the Entomology Laboratory of the UP College of Agriculture at Los Baños from December, 1952, to January, 1954, a period of 13 months. Field observations were made in the Central Experiment Station orchard.

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[1] Central Experiment Station Contribution No. 1742. Thesis presented by the senior author for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Entomology under the direction of the junior author

[2] L. G. Gonzalez and Pablo Feliciano, Jr., *Philippine Agriculturist* 37, 384 (1953).

[3] F. F. Gates Clark, *Philippine Agriculturist,* 37, 450 (1954).

MATERIALS AND METHODS

Life-history studies. Larvae of *Eustalodes anthivora* were collected from the field and reared to adulthood. The adults were transferred to wire breeding cages where they laid eggs on flower clusters of chico tips. The cut ends of the chico tips were immersed in water to keep them fresh. After the eggs had been laid the chico flowers were enclosed in vials. The larvae which hatched out of the eggs were cultured individually in cotton-plugged vials and observed every day for developments.

The habits of the adult were observed on confined specimens and on field materials.

Anatomical studies. Fresh specimens and preserved materials of the various stages of the insect were studied. The features of the egg were observed on fresh specimens. Anatomical studies of the larva were made on specimens which had been macerated in 5 per cent potassium hydroxide and stained with Gage's coccid stain. Supplementary observations were made on untreated specimens. Studies of the adult were made on untreated materials and on stained balsam mounts of KOH-macerated specimens. Measurements were taken with the aid of an eyepiece micrometer, and, whenever possible, a camera lucida was used in drawing the figures.

Host plants. The host plants were determined by direct observation of infested materials in the field. In the laboratory, flowers of caimito, *Chrysophyllum cainito* L., and *C. oliviforme* L., both members of the family Sapotaceae, were tried as feed for the larvae to test the possibility of their being hosts for the pest.

Seasonal occurrence. Three trees were observed for relative monthly severity of infestation by *Eustalodes anthivora.* The flowers of each tree were examined at monthly intervals, and the percentage of infestation by *Eustalodes anthivora* was noted.

Natural enemics. Eggs, larvae, and pupae were collected from the fields and confined in vials in the laboratory to see what parasites they would yield. Observations were also made in the field for other natural enemies of the insect.

Control measures. Dieldrin, methoxychlor, and DDT were tested for their efficacy in controlling *Eustalodes anthivora.* These insecticides were applied as separate sprays in the following concentrations: 10 grams of Gesarol to one gallon of water (about 0.13 per cent DDT) ; 11.36 grams of Marlate "50" to one gallon of water (about 0.15 per cent methoxychlor) ; and 4.5 milliliters of 15.85 per cent dieldrin concentrate to one gallon of water (about 0.02 per cent dieldrin.

Two sets of experiments were undertaken, one in the field and the other in the laboratory. In the field experiments, a tree each was sprayed with dieldrin, Marlate, and Gesarol after the infested and sound flowers had been counted. After about one month, the

fruits that had fairly developed from the sprayed flowers were counted. A tree which was sprayed with water served as control. Three replications were made: the first set was sprayed on May 9, the second on July 25, and the third on September 26, 1953. The sprays were applied as a fine mist by means of a compressed-air pump at the rate of one gallon to a tree.

In the laboratory experiments, two methods were used. In the first method, the blossoms were sprayed with the larvae already in them, whereas in the second method, the blossoms were sprayed first before the larvae were allowed to infest them. Three replications were made for each method. The sprayed materials were confined in breeding cages and examined at 30-minute intervals to note the number of killed larvae. A lot which was sprayed with tap water only was used as control. Spraying was done with an atomizer.

LIFE HISTORY

In the female, the incubation period ranges from 2 to 5 days, with a mean of 3.78 ± 0.106 days. Most of the eggs hatch 4 days after laying. The first stadium ranges from 1 to 4 days, with a mean of 2.4 ± 0.1056 days. The first molt occurs 2 or 3 days after hatching. The second stadium ranges from 1 to 3 days, or a mean of 1.62 ± 0.0703 days, with the second molt taking place usually within 2 days after the first molt. The third stadium ranges from 1 to 4 days, or a mean of 2.09 ± 0.0871 days, with the third molt taking place usually 2 days after the second molt. The fourth stadium ranges from 1 to 4 days, with a mean of 2.4 ± 0.0803 days. The fourth molt usually occurs 2 or 3 days after the third molt. The fifth stadium ranges from 1 to 4 days, or a mean of 1.84 ± 0.1051 days, with the fifth molt occurring usually 1 or 2 days after the fourth molt. The sixth stadium ranges from 1 to 3 days, or a mean of 1.27 ± 0.0496 days, with the pupation almost invariably taking place 1 day after the fifth molt. The duration of the pupal stage is from 3 to 7 days, with a mean of 5.0 ± 0.1928 days. The adults commonly emerge 5 days after pupation. The larval development (egg hatching to pupation) ranges from 9 to 14 days, with a mean of 11.60 ± 0.1769 days. Pupation usually occurs 11 days after hatching. The total developmental period (egg laying to emergence of the adult moth) ranges from 16 to 24 days, or a mean of 20.29 ± 0.1969 days.

In the male, the incubation period ranges from 2 to 5 days, or a mean of 3.75 ± 0.1916 days, with most of the eggs hatching 3 or 4 days after they have been laid. The first larval stadium ranges from 1 to 4 days, or a mean of 2.85 ± 0.1108 days, with most of the larvae undergoing the first molt 2 or 3 days after hatching. The second stadium ranges from 1 to 3 days, with a mean of 1.94 ± 0.1123 days. The second molt occurs usually 1 or 2 days after the first. The third stadium ranges from 1 to 4 days, or a mean of 2.14 ± 0.0697 days,

with the third molt occurring usually 2 days after the second. The fourth stadium ranges from 1 to 4 days, or a mean of 2.37 ± 0.0991 days, with the fourth molt most commonly occurring 2 or 3 days after the third. The fifth stadium ranges from 1 to 3 days, or a mean of 1.79 ± 0.0991 days, with the fifth molt usually occurring 2 days after the fourth. The sixth stadium ranges from 1 to 2 days, or a mean of 1.03 ± 0.0543 days, with the larva pupating almost invariably 1 day after the fifth molt. The pupal period ranges from 4 to 7 days, with a mean of 5.51 ± 0.145 days. Emergence usually takes place 5 days after the sixth molt. The larval period (egg hatching to pupation) ranges from 9 to 15 days, with a mean of 11.51 ± 0.2179 days. Pupation occurs usually 10 or 11 days after the egg has been laid. The total developmental period (egg laying to emergence of adult) ranges from 17 to 23 days, with a mean of 20.40 ± 0.3186 days. The adult emerges usually on the 19th or 20th day after the egg has been laid.

The corresponding stages of development of the two sexes do not seem to differ in duration.

The egg. (Pl. I, fig. 1). Oval, about 0.31 millimeter in length and 0.15 millimeter in greatest width. Pale yellow when newly laid but turns to yellowish orange and finally to orange with a blackish-yellow anterior end when about to hatch.

The eggs hatch at any time of the day, although hatching takes place usually in the morning or late in the afternoon. The hatching larva breaks the chorion at the anterior end of the egg and crawls out.

The larval instars. Eustalodes anthivora passes through six larval instars. The different larval instars are similar to each other except in size and color markings.

When newly hatched the first-instar larva is about 1.16 millimeters in length and 0.16 millimeter in width (average of 20 larvae). The head measures from 0.116 to 0.280 millimeter, or an average of 0.220 millimeter. The larva is translucent white, with a blackish-brown head and prothoracic shield.

The second-instar larva is about 2.85 millimeters in length and 0.49 millimeter in width (average of 20 larvae). The head ranges from 0.26 to 0.327 millimeter, or an average of 0.24 millimeter. The general body color is dark cream with blackish-brown head and prothoracic shield, as in the first instar.

The third-instar larva averages 3.94 millimeters in length and about 1.5 millimeters in width (20 larvae), the head being 0.52 millimeter in width. The general body color is pale red.

The fourth-instar larva averages 4.85 millimeters in length and 0.72 millimeter in width (20 larvae); the head averages 0.72 millimeter in width. It is of the same color as the third instar.

The features of the fifth-instar larva are as follows: length about 7.5 millimeters, width 1.4 millimeters, the head about 1 mil-

limeter wide (from 20 larvae). General color pale brownish red, with a white band at the anterior rim of the metathoracic segment.

The sixth-instar larva is no larger than the fifth. As it prepares for pupation it becomes shorter. The average width of the head (from 20 larvae) is 1.23 millimeters.

Head (Pl. I, fig. 2) seen from above subcircular in outline, about as long as broad, subequal in length to prothorax and about three-fourths in width. Epicranium sparsely beset with hairs, subspherical, slightly flattened dorsoventrally, two-thirds as thick as wide; outline from cephalic aspect broadly oval. Vertex deeply grooved. Antennae porrect, one-third as broad as mandible, situated on anterior margin of genae and between the mandibles; segment I subannular, width about one-half total length of antenna; II subannular, about one-third total length of antenna; III subannular, about same length as I, bearing two stout long bristles and one short slender bristle at its distal end; bristle about two-thirds as long as total length of antenna. Clypeus subrectangular, length about one-sixth of width. Labium subcrescent-shaped from cephalic aspect, anterior margin emarginate mesally, about as long as clypeus and two-thirds as wide; sparsely beset with short setae. Mandible very prominent, length about one-third as long as total length of head capsule. Spinneret prominent, elongate, as long as the diameter of mandible. Labial palpus about two-thirds as long and one-third as broad as spinneret, with one long and one short bristle at distal end.

Thorax subcylindrical, slightly tapering anteriorly, about one-fourth as long as total length of body; sparsely beset with setae. Prothorax about five-sevenths as long as broad; about five-sixths as long and five-sevenths as wide as mesothorax. Mesothorax about five-ninths as long as wide, about as long and broad as metathorax. Metathorax about as wide and long as abdominal segment I.

Thoracic legs taper gradually, decrease proximo-distally, each leg as long as prothorax, subconical, terminated by claw; coxa subspherical, as long as broad, bearing three bristles; trochanter subannular, about one-third as long as broad, and as broad as femur; femur subcylindrical, as broad as long, about as long and one-half as wide as coxa; beset with bristles posteriorly; tibia subcylindrical, about as long as femur, but slightly narrower, fringed with bristles; tarsus about two-thirds as long and as wide as tibia, with four bristles near insertion of claw; claw stout, sharply pointed, arcuate ventrally.

Abdomen subcylindrical, slightly tapering posteriorly, nine-segmented. Abdominal segments I to VIII bearing each a pair of spiracles; segments III, IV, V, VI, and IX each with a pair of prolegs; prolegs on abdominal segments III to VI coequal in size, about one and one-third as long as broad; prolegs on IX much larger than the more anterior ones. Segment IX beset with four long, stout setae above and four short, stout, truncate setae below.

The setal pattern on the fifth-instar larvae is shown in Pl. I, figures 3a, 3b, 3c, and 3d.

The first-instar larva enters the flower by following the lines where the petals overlap each other, eating its way in and tunneling between the petals. After the second molt, the caterpillar begins to bore into the young ovary where it subsequently grows fully. The larva is very active in the morning and late in the afternoon. Molting usually occurs early in the morning or late in the afternoon. The larva usually pupates in the larval tunnel in the ovary.

The pupa. (Pl. I, fig. 4). Subellipsoidal, rounded anteriorly, widest at fourth abdominal segment, tapering gradually posteriorly. Length of average-sized pupa, 5.93 millimeters; greatest width, 1.10 millimeters. General color brownish red anteriorly, shading to reddish brown posteriorly, with light-yellow color at tip of abdomen. Wing imagines reaching to abdominal segment VII posteriorly. Sparsely beset with microscopic hairs. Cremaster with 11 to 20 hooked spines.

The pupal stage is spent in the larval tunnel in the ovary. Sometimes, however, the larva goes out of the tunnel to pupate on the young leaves.

The adult. Female moth (Pl. I, fig. 5) average-sized, with wing expanse of about twelve millimeters. Viewed from above when the wings are folded over abdomen as when at rest, the moth is elliptical in outline, about six millimeters from tip of head to tip of wings, widest at about the middle of the folded wings. General color is gull gray throughout except for the eyes which are black and the scales along the veins of the wings which are grayish black, giving the wings an irregularly striped appearance. Ventrally, the moth is lighter gray than dorsally.

The male moth is of about the same size and color as the female. Aside from its genitalia, the male moth may be recognized in an unmacerated specimen by its more slender abdomen that terminates abruptly (gradually tapers to almost a point in the female) and is clothed heavily with long setae; also, the third segment of the labial palpus in the male (Pl. I, fig. 6b) is diminutive and surmounts the much enlarged second segment, whereas in the female this third segment of the labial palpus is dagger-shaped and, although narrower, is about as long as the second segment (Pl. I, fig. 6a).

The adult moths are exclusively nocturnal. During the day they remain among the grasses in the orchard. It was observed that trees in the plowed portions of the orchard were less severely attacked than those in the unplowed and, therefore, more weedy portions. Hence, it would seem that one way by which infestations may be reduced is to keep the orchard free of weeds especially at the height of the flowering season of the trees.

The female moth lays its eggs at night, depositing them singly or in groups of 2 to 5 around the peduncles of the flowers or on the

petioles of the leaves. Usually the eggs are laid on flowers that are almost ready to open, but occasionally eggs are deposited on the opened blossoms.

The adults do not seem to be attracted to ordinary white light. No moths were caught in light traps that were set in the orchard.

The longevity of the moths kept in confinement in the laboratory is presented in table 1. Both male and female moths may have a longevity of about a month, but on the average they die about eighteen days after emergence. The number of eggs that a moth may lay in confinement and the percentage of hatch are given in table 2.

The moth mates one day after emergence and begins to lay eggs as early as three days after mating. The eggs are laid over a period of two to three days. Breeding takes place at night at any time of the year.

HOST PLANTS

Only chico was observed to be infested by *Eustalodes anthivora* in the field. The different varieties of chico, including Ponderosa and Sao Manila, were all seriously infested.

In confinement, the third-instar larva and older larvae were induced to feed on blossoms of caimito, *Chrysophyllum cainito* L. A number of such larvae developed into pupae and subsequently emerged as adult moths. The young-instar larvae, however, did not seem to be able to subsist on this feed.

Table 3 and figure 1 show the percentage of infested blossoms of the three trees that were observed for the relative monthly abundance of the pest. December, January, February, March, April, May, and June, months of relatively low precipitation, were months of high infestation, whereas July, August, September, October, and November, decidedly rainy months, were months of relatively low infestation. The period of high infestation coincided with the height of the blossoming period (from November to May) of the trees.

NATURAL ENEMIES

During the study a number of natural enemies of the pest were observed. One species of crab spider was observed feeding upon the adult moths and another species of spider, on the larvae. A chalcid wasp proved to be a larval-pupal parasite, and a braconid wasp, a larval parasite.

CONTROL MEASURES

Laboratory tests. Table 4a shows the relative effectiveness of dieldrin, DDT, and methoxychlor in killing the larvae in infested flowers. In the three replications, dieldrin, DDT, and methoxychlor (Marlate) killed all the larvae within 24 hours after spraying,

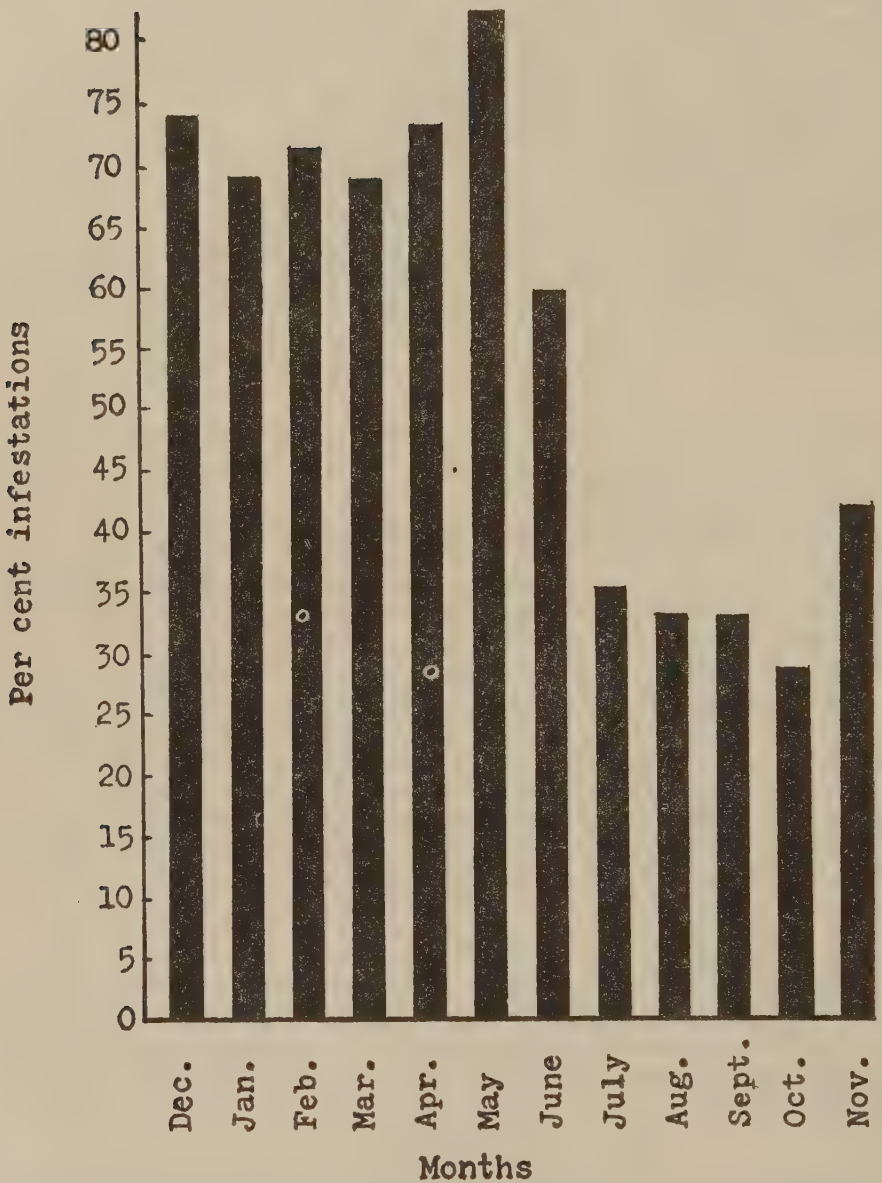


Fig. 1.—Monthly percentage infestations of blossoms of chico by *Eustalodes anthivora.*

whereas all the 10 larvae in the control remained alive within the same period. Of the three insecticides, DDT killed the larvae in the quickest time, within four hours after spraying.

Table 4b shows the relative effectiveness of dieldrin, DDT, and methoxychlor when sprayed on flowers before the larvae were allowed to enter them. The larvae in the dieldrin, DDT, and methoxychlor lots did not quite succeed in entering the flowers, but those in the control ate their way into the flowers.

The results point out that the three insecticides, DDT, dieldrin, and methoxychlor, are effective in either killing the larvae in infested blossoms or preventing the successful invasion of healthy blossoms by the larvae.

Field experiments. Table 5 shows the percentage of fruits that set in the three replications of the control, DDT-sprayed, dieldrin-sprayed, and methoxychlor-sprayed trees. Even without statistical analysis, the results indicate that DDT, dieldrin, and methoxychlor are effective sprays in the control of *Eustalodes anthivora.* The sprays, however, slightly injured the more tender foliage and flowers. The young leaves dried up in spots and at the tips, and the petals of the flowers dried up.

TABLE 1

Longevity of Eustalodes anthivora moths

LONGEVITY	FREQUENCY	
	Males	Females
days		
10	0	3
11	0	2
12	2	3
13	1	6
14	0	7
15	2	10
16	13	11
17	2	6
18	5	4
19	4	1
20	8	0
21	4	0
22	5	1
23	4	0
24	1	1
25	1	0
Average longevity	18.65 ± 0.427	15.08 ± 0.358

TABLE 2

Number of eggs laid by Eustalodes anthivora moths and percentage of hatch

FEMALE NO.	TOTAL NUMBER LAID	NUMBER HATCHED	PERCENTAGE OF HATCH
1	74	66	89.18
2	112	95	84.82
3	82	76	92.68
4	85	74	87.06
5	114	97	85.09
6	101	94	93.07
7	114	94	82.45
8	105	91	86.66
9	125	98	78.40
10	125	109	87.20
11	125	105	84.00
12	100	87	87.00
13	134	113	84.32
14	55	38	69.09
15	80	46	57.50
16	90	36	40.00
17	64	59	92.18
18	66	62	93.93
19	57	53	92.98
20	90	86	95.55
21	85	77	90.59
22	71	65	91.55
23	110	100	90.90
24	92	74	80.43
25	120	106	88.33
26	95	85	89.47
27	105	92	87.62
28	62	51	82.25
Average	94.21 ± 4.29	79.61 ± 1.32	84.43

TABLE 3

Monthly infestation of chico blossoms by Eustalodes anthivora

MONTH	NO. OF FLOWERS EXAMINED	NO. OF FLOWERS INFESTED	PERCENTAGE INFESTATION
December, 1952	2084	1543	74.04
January, 1953	2498	1717	68.7
February, "	1654	1179	71.3
March, "	979	683	69.8
April, "	1372	1015	73.9
May, "	1378	1106	80.2
June, "	685	407	59.4
July, "	727	261	35.9
August, "	521	177	33.9
September, "	427	145	33.9
October, "	656	181	27.6
November, "	1249	536	42.9

TABLE 4a

Effectiveness in the laboratory of dieldrin, DDT, and Marlate as sprays in killing the larvae of Eustalodes anthivora in infested flowers

AFTER	NO. OF LARVAE KILLED											
	Dieldrin (0.024%)			DDT (0.13%)			Marlate (1.49%)			Control		
	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III
30 min.	1	1	1	2	2	1	0	0	0	0	0	0
1 hr.	1	1	0	4	2	3	1	1	1	0	0	0
1½ hrs.	1	1	1	2	3	1	2	2	1	0	0	0
2 "	5	2	2	1	2	2	1	1	1	0	0	0
3 "	0	1	1	1	1	2	0	0	1	0	0	0
4 "	1	1	1	—	—	1	0	0	1	0	0	0
5 "	1	1	2	—	—	—	0	1	2	0	0	0
6 "	—	2	2	—	—	—	5	3	3	0	0	0
24 "	—	—	—	—	—	—	1	2	—	0	0	0
Total	10	10	10	10	10	10	10	10	10	0	0	0

TABLE 4b

Effectiveness in the laboratory of DDT, dieldrin, and Marlate sprayed on blossoms before they were infested with Eustalodes anthivora caterpillars

AFTER	NO. OF LARVAE KILLED											
	Dieldrin (0.024%)			DDT (0.13%)			Marlate (0.15%)			Control		
	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III	Trial I	Trial II	Trial III
30 min.	0	0	0	0	0	0	0	0	0	0	0	0
1 hr.	1	0	0	1	0	1	0	0	0	0	0	0
1½ hrs.	0	0	1	1	1	0	1	0	0	0	0	0
2 "	1	2	2	2	1	1	1	1	0	0	0	0
3 "	1	0	1	1	1	2	1	1	1	0	0	0
4 "	1	2	1	0	1	2	0	1	1	0	0	0
5 "	1	0	0	3	2	4	1	1	2	0	0	0
6 "	4	4	3	2	3	—	2	2	1	0	0	0
24 "	0	2	2	—	1	—	3	3	4	0	0	0
	9	10	10	10	10	10	9	9	9	0	0	0

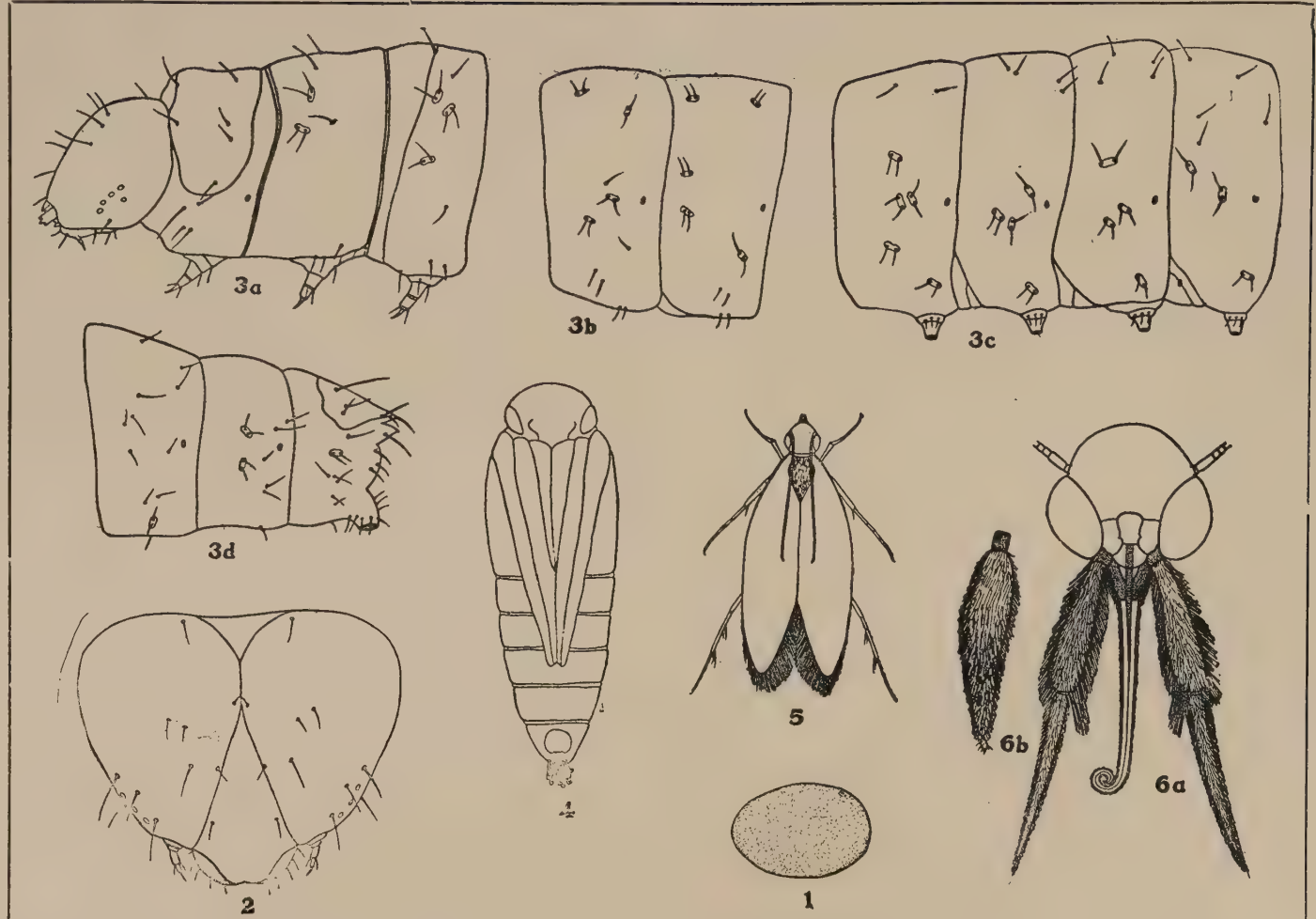
TABLE 5

Percentage of fruit set in control trees and trees sprayed with DDT, dieldrin, and Marlate

TRIAL NO.	DATE TREATED	CONTROL			DDT (0.13%)			DIELDRIN (0.024%)			MARLATE (0.15%)		
		No. of flowers	No. of fruits	Fruit set	No. of flowers	No. of fruits	Fruit set	No. of flowers	No. of fruits	Fruit set	No. of flowers	No. of fruits	Fruit set
				per cent			*per cent*			*per cent*			*per cent*
1	9–V–53	609	67	11.00	427	271	63.46	223	139	62.77	191	94	48.45
2	25–VII–53	153	9	5.88	138	100	72.46	103	67	65.04	204	97	47.54
3	26–IX–53	438	78	17.80	149	98	63.95	146	79	54.11	119	54	45.46
		1200	154	12.83	714	469	66.62	472	285	60.64	514	245	47.15

PLATE I

Fig. 1.—Egg (× 25).
Fig. 2.—Head of fifth-instar larva of *Eustalodes anthivora*, anterior aspect (× 38).
Fig. 3a.—Fifth-instar larva, side view of head and thoracic segments (× 23).
Fig. 3b.—Fifth-instar larva, side view of abdominal segments I and II (× 23).
Fig. 3c.—Fifth-instar larva, side view of abdominal segments III, IV, V, and VI (× 23).
Fig. 3d.—Fifth-instar larva, side view of abdominal segments VII, VIII, and IX (× 23).
Fig. 4.—Pupa of *Eustalodes anthivora*, ventral aspect (× 7.5).
Fig. 5.—Female *Eustalodes anthivora* moth, dorsal aspect (× 6).
Fig. 6a.—Head of a female *Eustalodes anthivora* moth, anterior aspect (× 20).
Fig. 6b.—Labial palpus of male *Eustalodes anthivora* moth (× 25).



DEL ROSARIO AND CENDAÑA: BIONOMICS OF EUSTALODES ANTHIVORA CLARKE

THE EFFECT OF SYNTHETIC ESTROGEN IMPLANTATION ON GAIN IN WEIGHT AND SUBSEQUENT REPRODUCTIVE ABILITY OF YOUNG S. C. WHITE LEGHORN COCKERELS [1]

AMADO C. CAMPOS AND F. M. FRONDA

Pellet implantation induced better gain in body weight, decreased mortality, effected temporary suppression of male aggressiveness and pugnacity, but permitted the majority of the treated males to recover and exhibit a normal mating behavior and a normal level of fertility. These findings show that besides being used to induce young birds to put on weight, estrogen-pellet implantation may be used to temper the restless and pugnacious disposition of growing cockerels without hampering their ability to meet the breeding function expected of them later.

Synthetic estrogens injected subcutaneously or implanted under the skin in pellet form or mixed with the feed are now widely used by American poultry raisers for fattening broilers. The administration of these hormones to the birds induces an increase in blood fat which effects an increase in the deposition of fat under the skin, in the abdominal cavity, and in the muscles, resulting in carcasses that are better finished and more tender than those of untreated birds. Aside from this fattening effect, estrogen treatment induces temporary cessation of sexual behavior in male birds. The comb and wattles shrink and become pale; the neck and saddle feathers grow much longer, although the sickle feathers do not develop; and the skin becomes soft, smooth, velvety, and pliable.[2]

The adverse effect of estrogen injection on testes size as induced by the depressed production of gonadotropic hormones is a well-accepted fact. Zondek [3] administered estrogen to cockerels for long periods and found that the testes of the cockerels were reduced to 3 to 4 per cent of the normal with only Sertoli cells and spermatogonia present in the tubules. Emmens [4] gave prolonged dosages of estrone and estradiol benzoate to cocks and produced similar atrophy of the testes. The birds, however, recovered slowly after cessation of the treatment. Campos and Fronda,[5] using diethylstilbestrol pellets on 7- and 12-month-old S. C. White Leghorn males, observed differences in the rate of recovery of the birds from the estrogen treatment as shown by the differences in the period of reenlargement and reddening of the combs. Some birds recovered as early as three weeks after pellet implantation, whereas others were

[1] Central Experiment Station Contribution No. 1743. Read at the two hundred twenty-second scientific meeting of the Los Baños Biological Club, January 29, 1954.

[2] G. F. Heuser, G. O. Hall, and J. H. Bruckner, "Poultry Management," J. B. Lippincott Company, Chicago, Philadelphia, and New York, 1952, 565 pp.

[3] B. Zondek, *Folia Clinica Quentalia*, 1 (1937).

[4] C. W. Emmens, *Journal of Physiology*, 94, 221 (1939).

[5] A. C. Campos and F. M. Fronda, *Agric. and Indus. Life*, Oct. 30 (1950).

still under the hormone influence even after the six-week observation period.

Bird, Pugsley, and Klotz [6] fed 20 milligrams of dimethyl ether of diethylstibestrol daily to yearling males and got variable results. Some cockerels maintained their fertility, whereas in others the testes became atrophic with only spermatogonia present in the tubules. The same workers also reported that when estrogens were administered, the secondary sex characters suffered regression more readily than the testes, indicating that hormone production is stopped before the testes begin to atrophy. Akpinar and Shaffner [7] found that the sexual maturity of treated males appeared retarded and the semen quantity decreased. The treated males, nevertheless, produced semen of good fertilizing quality.

These and many other reports on the effect of estrogen treatment on male birds tend to indicate that healthier and less pugnacious cockerels may be grown for breeding purposes with the use of synthetic estrogen. Since cockerels become restless and troublesome as soon as they begin to express their sexual desire, resulting in loss of weight, physical injury, and even death, it would be a big step forward in the growing of breeding males if they could be kept healthy and their mating instinct suppressed until they reach the proper age for breeding. To find out if this is feasible with the use of synthetic estrogens, this study was conducted in the Department of Animal Husbandry from June to December, 1953.

MATERIALS AND METHODS

One hundred selected 2½- to 3-month-old S. C. White Leghorn cockerels were divided equally into two groups of 50 birds each, depending on age and size, and then leg banded and weighed. One group (lot I) was left untreated to serve as control; each bird in the other group (lot II) was implanted with a 15-milligram pellet of diethylstilbestrol in the upper neck region just below the skull. The birds were kept for 20 weeks in two separate pens of 2 × 3.5 meters with adjoining sun porches. Both lots were given the same ration consisting of 50 parts cracked corn and 50 parts mash. The mash consisted of the following ingredients, all parts by weight: rice bran, 40 parts; corn, 20 parts; fish meal, 20 parts; copra meal, 10 parts. The birds were given the same care and management.

Records of initial and weekly weights, number of deaths, sexual behavior, and external structural changes of birds in the treated lot were taken and compared with those of the control. For comparison of their fertilizing abilities, four representative birds from each lot were picked after the twentieth week and mated to laying pullets. Four pens with 30 S. C. White Leghorn layers each were used for this purpose; one pen was assigned to every two cockerels from each lot. The eggs gathered from all the four pens during the next 13

[6] S. Bird, L. I. Pugsley, and M. O. Klotz, *Endocrinology*, 41, 282 (1947).
[7] A. C. Akpinar and C. S. Shaffner, *Poul. Sci.*, 32, 119 (1953).

days were saved and tested for fertility. Eggs were again saved for hatching from the 45th to the 60th day.

RESULTS AND DISCUSSION

Weekly weight. The estrogen treatment resulted in a consistent increase in the weekly weight of the cockerels (table 1). The estrogen birds showed heavier and more uniform gains in weight than the control birds throughout the entire observation period. The maximum difference in weight between the two lots was during the sixth week. This difference, when statistically analyzed, was found to be significant. In general, the results obtained suggest that the cockerel's body is improved by estrogen implantation. The greatest improvement was induced during the first few weeks after treatment.

Mortality. It is surprising to note that although a number of the birds in lot II became sick, no death occurred in this group during the entire period of observation. On the other hand, lot I showed a total of 13 deaths, or 26 per cent, generally from roup aggravated by the pecking and mounting of the sick and weak birds by the healthy aggressive ones. Since diethylstilbestrol treatment is not known to impart any therapeutic effect, the seemingly greater resistance of the estrogen cockerels may be attributed to the reserve fat they were able to put on.

Changes in physical appearance and behavior. As early as four days after treatment, the experimental birds showed the effect of the estrogen implantation by the drying up of their combs. About the early part of the second week, capon behavior was exhibited, that is, the hormonized birds became docile and less active, they lost their sex drive, and they had improved appetites. Signs of modification of feathers in the neck, rump, and tail into caponlike feathers became noticeable during the third week and persisted in some birds till the end of the 20-week period.

The effect of the estrogen treatment as indicated by the capon behavior and the small, dry, pale combs was, however, exhibited temporarily by the individual birds. The first group recovered from the effect of the estrogen as shown by the re-enlarged red combs and the reappearance of male behavior as early as the fifth week after treatment; the majority recovered during the succeeding weeks. By the end of the twentieth week, 45 of the 50 treated cockerels had reverted to full normal behavior (table 1) except for the presence of capon plumage in some and of abnormally small spurs in most of the birds. Five of the treated birds, however, failed to recover, and at the end of the observation period they closely resembled surgical capons in appearance and behavior.

Mating behavior and fertility of recovered males. The four cockerels selected from the treated lot for mating exhibited exactly the same attitude and sexual behavior as the four from the untreated lot. Perhaps because of their inexperience and unfamiliarity with the other sex, the males from both lots, though highly eager to cover

the females at the start, were observed to encounter difficulty in mounting the pullets. After a quarter of an hour, however, one of the controls and one of the treated males were able to copulate successfully, and before the first hour had elapsed all eight males in the four pens had served some of the females.

The results of the fertility tests using 538 eggs from the control lot and 516 eggs from the treated lot are presented in table 2. No eggs were fertilized by the males from both lots during the first day of mating. On the second day, some eggs were obtained with surprisingly high percentage fertility from the females mated to the treated males. On the third day, fairly good percentage fertility was obtained from both groups which, except for the results obtained from the treated group on the fourth setting, was steadily maintained up to the last setting on the 13th day. Settings using eggs produced from the 45th to the 60th day after mating also showed the same results.

An examination of all the percentage fertility figures indicates that the recovered estrogen-treated males can effect a normal level of fertility, but their fertilizing capacity is somewhat inferior to that of the untreated males. These findings corroborate the report made by Akpinar and Shaffner (1953) that estrogen-treated males were equally able to induce fertility as the controls, but that semen production was less in the treated males, which possibly explains the somewhat lower percentage of fertile eggs produced by that group.

It would have been interesting if the recovered estrogen birds had been grouped and tested according to their rate of recovery from the inhibiting effect of the estrogen, but the limited number of laying pens available at the time of the study did not make this arrangement possible.

TABLE 1

Weekly weight and number of birds alive in both lots and number of recovered birds in the treated lot

WEEKS AFTER TREATMENT	WEEKLY WEIGHT		NO. OF BIRDS ALIVE		NO. OF RECOVERED BIRDS IN TREATED LOT
	Control	Treated	Control	Treated	
	grams	*grams*			
Initial	683.4 ± 12.9	642.6 ± 15.0	50	50	0
1	752.8	743.4	50	50	0
2	838.0	850.0	50	50	0
3	912.2	970.0	40	50	0
4	969.4	1040.0	49	50	0
5	1008.9	1114.0	45	50	5
6	1076.2	1210.0 [a]	42	50	6
7	1094.0	1221.0	40	50	7
8	1165.0	1302.0	40	50	7
9	1273.7	1364.0	38	50	7
10	1363.2	1440.0	38	50	13
11	1402.7	1502.0	37	50	16
12	1475.7	1568.0	37	50	24
13	1535.1	1646.0	37	50	24
14	1578.4	1694.0	37	50	27
15	1618.9	1740.0	37	50	31
16	1637.8	1764.0	37	50	33
17	1678.3	1790.0	37	50	39
18	1700.0	1790.0	37	50	40
19	1740.5	1810.0	37	50	41
20	1739.4 ± 49.6	1790.0 ± 37.8	37	50	45

[a] Significant.

TABLE 2

Fertility test of cockerels

DAYS AFTER MATING	NO. OF EGGS PRODUCED		PERCENTAGE OF FERTILITY	
	Control	Treated	Control	Treated
1	11	12	0.0	0.0
2	9	11	33.3	54.5
3	7	8	85.9	75.0
4	13	8	84.6	62.5
5	6	11	100.0	77.7
6	12	13	91.7	84.6
7	28	20	82.1	85.0
8	21	20	95.2	85.0
9	17	18	94.1	100.0
10	18	21	94.4	80.9
11	22	24	95.5	91.6
12	18	16	100.0	93.8
13	22	21	100.0	95.0
45–60	334 [a]	313 [a]	94.4	92.0

[a] Made up of eggs saved for two 7-day periods.

THREE FREQUENCIES OF FEEDING GROWING AND FATTENING PIGS [1]

TOMAS R. CORTES

As far as rate of gain in weight was concerned, the three-times-a-day feeding was more advantageous than either the once-a-day feeding or the twice-a-day feeding during the first 12 weeks or growth period of the weanling pigs. During the second and third 12 weeks of feeding, or the growth and fattening period, the twice-a-day feeding proved to be more desirable from the standpoint of rate of gain, feed cost to produce a unit gain, and feed required to produce a unit gain in weight than either the once- or the thrice-a-day feeding. The pigs fed once a day showed the poorest results among the three lots. Further study is necessary to make these results more conclusive.

In the feeding and management of swine in the Philippines, different frequencies of feeding are practiced. Some hog raisers feed their hogs three times, others two times, and still others only once a day. As to which of these systems give the most satisfactory results with respect to the rate and economy of gain in weight, no definite conclusion has yet been made because of the absence of accurate data. In most, if not all, of the experiments on swine feeding conducted in the College of Agriculture, however, the pigs are fed twice a day.

To determine the influence of three frequencies of feeding on the rate of gain in weight and the economy of production of pigs, this work was conducted from March 21 to November 28, 1953, in the Department of Animal Husbandry, College of Agriculture.

MATERIALS AND METHODS

Twelve Berkjala weanling pigs (six barrows and six females) were divided equally according to age, weight, and condition into three lots of two barrows and two females each. The randomized block method of distribution was employed. Each pig was fed separately in an individual pen with adjoining run.

The whole feeding test, which lasted for 252 days, was divided into three periods of 84 days each. During the first feeding period, the pigs in all the lots were given the College swine ration No. 2, and during the second and third 84-day feeding periods, they were given College swine rations No. 3 and 4, respectively. The proportions of the ingredients used in the different rations, all parts by weight, are as follows:

[1] Central Experiment Station Contribution No. 1744. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Dr. Faustino S. Mensalvas and Mr. Avelino B. Manuel.

INGREDIENT	RATION NO. 2	3	4
Ground corn	15	20	25
Rice bran	60	60	60
Copra meal	18	16	13
Fish meal	7	4	2
Total	100	100	100

In addition to the above feed mixtures, each ration was supplied with a 2 per cent mineral mixture composed of 2 parts ground shells and one part common table salt.

The pigs in lot I were hand-fed once a day between 3:00 and 4:00 o'clock in the afternoon; lot II, twice a day, once in the morning between 7:00 and 8:00 o'clock and again in the afternoon between 3:00 and 4:00 o'clock; lot III, three times a day, the first one in the morning between 7:00 and 8:00 o'clock, the second between 11:00 and 12:00 o'clock, and the third in the afternoon between 3:00 and 4:00 o'clock. The pigs were fed as much feed as they could readily consume in about 30 minutes of feeding.

In addition to the concentrates, the pigs were given soilage of camote vines daily at the rate of 2 per cent of their live weights. Drinking water was made available to them at all times. The pigs were bathed regularly especially before weighing. Except for the frequencies of concentrate feeding, all the pigs in the three lots were given practically identical care and management.

The initial weights and successive weekly weights of the pigs, as well as their weekly feed consumption, were taken. The monthly cost of feed was also recorded.

RESULTS AND DISCUSSION

In the present study, the bases for determining the relative efficiency of the three frequencies of feeding were the following: (1) rate of gain in weight of the pigs, (2) amount of feed, in kilograms, to produce a kilogram gain, and (3) cost of feed, in centavos,[2] to produce a kilogram gain.

First 84-day period. The results as regards rate of gain show that lot III made the highest average daily gain, lot II the second, and lot I the least (table 1). Pigs No. 1434 and 1468 in lot III failed to make normal gains during the later part of this period. Had it not been for this, lot III would have made a much higher gain than the other lots. The differences in gain, however, were statistically significant (table 2). The advantageous effect of the three-times-a-day feeding may be explained by the fact that the young growing animals could eat more of the food supplied them than those animals that were fed once or twice a day.

[2] Feed cost was based on seventeen centavos for every kilogram of feed mixture.

Lot III pigs consumed the most feed for a kilogram gain in weight, lot II, the second, and lot I, the least. With respect to the cost of feed needed to produce a kilogram gain in weight, lot I cost the least and lot III cost the most.

Second 84-day period. During this period, post-mortem examination revealed that one pig in lot II had died of kidney worms (*Stephanurus dentatus*). A marked increase in the average daily gain in weight of the remaining three pigs in this lot was noted (table 1). The big difference in average daily gain between lot II and the other two lots may be explained by the fact that pig No. 1456 in lot II, which died during the first period, was rather small and had made very poor gains. The remaining three pigs in this lot, however, made rapid gains thereafter. The animals in lot I showed consistently slow gains probably because the feed they consumed was much less than that consumed by either lot II or lot III. On the other hand, two pigs in lot III, No. 1434 and 1464, failed to make normal gains in weight at the onset of this period. It was only in the later part that these pigs started to make normal gains.

In feed consumed to produce a kilogram gain, lot II gave better results than either lot I or lot III. The same was true of feed cost to produce a kilogram gain in weight.

Third 84-day period. At the end of the third 84-day period, lot II had the highest average daily gain and lot I, the lowest (table 1). In the conversion of feed to make a kilogram gain in weight, lot III required the most feed, lot I, the second, and lot II, the least. From the standpoint of feed cost to make a kilogram gain, lot II was still the most economical, lot I was second, and lot III was the most expensive.

The entire 252-day period. For the entire 252-day feeding test, lot II (fed twice a day) had an apparently higher rate of gain in weight than either lot I or lot III (table 1). As to the amount of feed needed to produce a kilogram gain, lot II showed a much better result than either lot I or lot III. In feed cost to produce a unit gain, lot II showed apparently better result than lots I or III.

The animals in all the lots throughout the experiment were observed to be in good condition; those in lot II were more uniform in size than those in lots I or III. The final weights of the animals ranged from 69.8 kilograms to 100.2 kilograms in lot II, from 40.6 kilograms to 97.8 kilograms in lot III, and from 38.8 kilograms to 70.0 kilograms in lot I. There evidently was a wide individual variation in the final weights of the animals (table 3). These differences could have been detected if some control had been used to minimize experimental error.

TABLE 1

Summary of results

	FIRST 84-DAY FEEDING PERIOD			SECOND 84-DAY FEEDING PERIOD			THIRD 84-DAY FEEDING PERIOD			ENTIRE 252-DAY FEEDING PERIOD		
	I	II	III	I	II	III	I	II	III	I	II	III
Number of pigs	4	4	4	4	3	4	4	3	4	4	3	4
Average initial weight of a pig (kg.)	8.35	9.15	9.30	22.20	30.07[a]	30.5	37.75	56.27	51.1	8.35	9.15	9.30
Average final weight of a pig (kg.)	22.2	27.2	30.05	37.75	56.27	51.1	55.6	83.13	71.9	55.60	83.13	71.90
Average gain in weight of a pig (kg.)	13.85	18.05	21.20	15.55	26.2	20.6	17.85	26.86	20.8	47.25	73.98	62.60
Average daily gain in weight of a pig (kg.)	0.17	0.22	0.26[b]	0.19	0.31	0.25	0.21	0.32	0.25	0.19	0.29	0.25
Average daily feed consumed by a pig (kg.)	0.61	0.82	1.08	1.29	1.44	1.93	1.68	1.89	2.40	1.38	1.34	1.80
Average ration for every 100 kg. live weight of a pig (kg.)	4.01	4.48	5.50	4.30	3.34	4.80	3.59	2.70	4.00	4.52	3.01	4.47
Average feed consumed for a kg. gain of a pig	3.72	3.79	4.30	6.90	4.63	7.88	7.89	5.89	9.68	7.23	4.80	7.26
Average feed cost for a kg. gain of a pig	0.63	0.64	0.73	1.17	0.79	1.34	1.34	1.00	1.65	1.23	0.82	1.24

[a] Based on three pigs.
[b] Significant at 5% level.

TABLE 2

Gain in weight in kilograms during the first 84-day period

BLOCK	LOT			SUM	MEAN
	I	II	III		
I	8.8	13.0	15.6	37.4	12.47
II	15.4	20.2	29.2	64.8	21.60
III	11.2	16.4	16.0	43.6	14.53
IV	20.0	22.6	24.0	66.6	22.20
Sum	55.4	72.2	84.8	212.4	
Mean	13.85	18.05	21.20		

Analysis of variance

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARES	COMPUTED F-VALUE	TABULAR F-VALUE	
					.05	.01
Block (B)	3	218.63	72.88			
Treatment (T) .	2	108.78	54.39	8.61	5.14	10.92
B × T	6	37.91	6.32			
Total	11	365.32				

L.S.M.D. = 5.02

TABLE 3

Gain in weight in kilograms during the entire 252-day period

BLOCK	LOT			SUM	MEAN
	I	II	III		
I	32.6	43.16[a]	32.8	108.56	36.2
II	54.8	67.8	83.2	205.8	68.6
III	39.6	61.4	48.0	149.0	49.67
IV	62.0	89.2	86.4	237.6	79.2
Sum	189.0	261.56	250.4	700.96	
Mean	47.3	65.4	62.6		

[a] Missing value.

Analysis of variance

SOURCE OF VARIATION	DF	SUM OF SQUARES	MEAN SQUARES	COMPUTED F-VALUE	TABULAR F-VALUE	
					.05	.01
Block (B)	3	3,319.15	1,106.38			
Treatment (T) .	2	763.29	381.65	4.73	5.79	13.27
B × T	5	403.38	80.68			
Total[a]	10	4,485.82				

[a] Minus 1 DF for missing data.

THE CONSUMPTION OF COMMON SALT BY CARABAOS [1]

ALEXANDER A. GARSULA

Based on an average two-week intake of 509.8 grams, the average yearly consumption of salt of a mature female carabao was 13.289 kilograms; the daily consumption of a head was 36.4 grams. The average salt consumption of a carabao calf was 4.747 kilograms a year; the daily consumption a head was 13.0 grams. From the drinking water a mature dry carabao received 0.98 gram of combined KCl and NaCl daily; a carabao calf received 0.12 gram a day.

Judged by the amount of moisture absorbed by the salt at different months of the year, salt should be placed in the troughs in large quantities from February to May and in small quantities during the rest of the year.

Salt hunger is not uncommon in farm animals. There is evidence of this in the Purdue experiments [2] where animals deprived of salt ate excessively of other minerals. When salt was supplied, the quantity of bonemeal and limestone consumed was materially cut down. Animals' hunger for salt is just as keen as their hunger for feed and thirst for water, and it is just as real and far-reaching in its effects. Abnormal appetite, chewing of soil, litter, and objects, licking of the herdman's jacket, and cannibalism of chicken may often be traced to insufficient salt. Without salt, there is rapid deterioration of the many physiological processes of the body. The animals starve even though they are given the usual feed. A cow going without a sufficient amount of salt over a long period has been reported to develop a strong craving for it, gradually lose vitality, become rough-haired and thin in flesh, and finally suffer a complete breakdown.

Work was conducted in the Department of Animal Husbandry, College of Agriculture, University of the Philippines, Los Baños, Laguna, to determine (1) the amount of common salt consumed by mature female carabaos and by carabao calves and (2) the amount of water absorbed by salt when exposed to open air. The study on carabao calves was begun on September 11, 1952, and ended on September 10, 1953; that on mature female carabaos was begun on September 13, 1952, and ended on September 12, 1953.

MATERIALS AND METHODS

Animals. The first group of 19 animals was composed of all the grade Murrah dry carabaos in the dairy herd and calves of milking dams. The ages of the dry carabaos ranged from three years to

[1] Central Experiment Station Contribution No. 1745. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Mr. Leopoldo S. Castillo.

[2] Morton Salt Company, "Trace Mineralized Free Choice Salt for All Your Livestock."

29 years. The other group consisted of 18 carabao calves, one-half of which were males. Their ages ranged from two months to one year.

Calf pens. The calf pens used were inside the dairy barn. They were 12 feet × 12 feet in size and had concrete floors and walls. Each was provided with a salt box one foot above the floor and lined inside with galvanized iron, 4 feet × 1½ feet × ½ foot. Water from the College of Agriculture water supply was piped to the pens.

Pastures. The mature female carabaos were pastured in Pinagtulusan pasture which has an approximate area of three and one-half hectares. The pasture was fenced with barbed wire to prevent the animals from going out. The edible pasturage was composed of cogon (*Imperata cylindrica* [Linn.] Beauv.), culape (*Paspalum conjugatum* Berg.), *Calopogonium mucunoides* Desv., and ipil-ipil (*Leucaena glauca* [Linn.] Benth.). Water was piped to a concrete watering trough.

The pasture near the dairy barn, about one and one-half hectares, served the carabao calves. The common pasturage grasses found were culape, cogon, Calopogonium, and *Centrosema pubescens* Benth.

Salting shed. A semipermanent shed in the pasture housed a salt box for the mature female carabaos. The shed was 7½ meters by 5 meters and the edge of the roof was two meters from the ground. The salt box, 9 feet × 1½ feet, was one foot above the ground and lined inside with galvanized iron.

Common salt. Granulated common salt from Parañaque, Rizal, was used in this experiment. The weight of one sack was about thirty-six kilograms. Salt samples were analyzed monthly for moisture content in the Department of Agricultural Chemistry of the College. An analysis of common table salt furnished by the Division of Tests and Standards, Institute of Science and Technology, Manila, is given below:

Water insoluble residue	0.21 per cent
Iron oxide (Fe_2O_3)	0.13 per cent
Alumina (Al_2O)	0.57 per cent
Lime (CaO)	0.61 per cent
Magnesia (MgO)	0.94 per cent
Sulfurtrioxide (SO_3)	1.73 per cent
Moisture at 110°C.	12.28 per cent
Sodium chloride by difference	83.53 per cent

Management of animals. The mature female carabaos were treated as range animals; that is, they were allowed to graze freely day and night in the pasture. The animals had access to salt in the daytime and to water at all times. Salt was supplied every other day in amounts that the animals readily consumed. The leftover was weighed to determine the consumption for every two-week period. Animals which gave birth in the course of the work were taken to the dairy barn for milking and were excluded from the

experiment. In their place, animals in the dairy barn which were about to become dry were substituted. The carabaos were weighed to see if they were getting enough feed. Supplemental feeds were given to them since the pasturage was not enough. They were fed corn and grass silage, corn stover, and Napier and Guatemala grasses as soilage.

The same method of salting was followed for carabao calves. The calves were kept at all times in the calf pens, except when they were let loose in the pasture for exercise and sunbathing. The animals were fed concentrates and Para, Napier, and Guatemala grasses as forage. They were allowed to suck milk from their dams before milking. Calves more than one year of age were dropped from the experimental group, and others more than two months old were added from time to time.

To ensure that consumption by the animals would be entirely due to the difference in weight of the salt, the salting troughs were lined inside with galvanized iron to prevent loss from leaching, and they were covered in the evening to prevent passers-by from tampering with their contents.

Determination of the moisture content of salt. At the beginning of each month, samples of salt from the sacks were analyzed for moisture content. Salt from the same source was placed in a glass container, hung, and exposed to the air in the middle of the shed. At the end of each month, the moisture absorbed by the salt sample was determined in the Department of Agricultural Chemistry of the College.

RESULTS AND DISCUSSION

Table 1 shows the body weight and salt consumption of the mature female carabaos from September 13, 1952, to September 12, 1953. The number of animals used every two-week period ranged from nine to thirteen since some were excluded because of parturition and others were included as they became dry. The average two-week consumption of salt of 509.8 grams is equivalent to a daily consumption of 36.4 grams a head, or 13,289 kilograms a head yearly. At ₱0.07 a kilogram of salt, the cost of the average amount of salt consumed every two weeks was ₱0.036, or ₱0.93 yearly for an animal.

Like the mature female carabaos, the carabao calves also received salt for one year from September 11, 1952, to September 10, 1953 (table 2). Ten calves were used at the beginning of the work. This number decreased, however, for some died and others passed the age of one year. Later on, more calves became available as they reached the age of two months when they began to lick salt. In terms of daily and yearly consumption, the average two-week salt consumption was equivalent to 13.0 grams and 4.747 kilograms, respectively. The cost of the average salt consumed by each head was ₱0.013 in two weeks, or ₱0.33 in a year.

The animals received additional sodium chloride from the water they drank. According to Cruz and Marfori [3] the combined KCl and NaCl content of the water of the College of Agriculture is, on the average, 34.6 parts per million. The amount of KCl and NaCl taken in by the animals from the water they drank was computed on the basis of the average of 25.5 kilograms of water a head daily for native carabaos reported by Villegas.[4] If it is assumed that the grade Murrah carabaos drank the same volume of water, the combined KCl and NaCl that the mature dry carabaos received from the water they drank was 0.98 gram a head daily. Carabao calves received 0.12 gram of the combined KCl and NaCl a head a day, since they drank 3.5 kilograms of water on the average.

There was an almost uniform percentage of moisture content in the salt samples before exposure, that is, right after being taken out of the storeroom every month (table 3). After exposure, the salt, which is deliquiscent in nature, absorbed different amounts of moisture according to the relative humidity of the atmosphere, which varies at different times of the year. From September, 1952, to January, 1953, the moisture absorbed by the salt was practically uniform, except for the fluctuation in the month of November; during this five-month period, moisture absorption of salt was at its peak. During the months of February, March, April, and May, moisture absorption by salt was at its lowest. From June to August, it was moderate.

From this knowledge of moisture absorption by salt throughout the year, it is apparent that one can reduce loss from leaching from June to January by supplying the animals with salt in small quantities and save labor from February to May, when loss from leaching is negligible, by placing larger amounts of salt in the troughs.

[3] R. A. Cruz and R. T. Marfori, *Philippine Agriculturist* **22**, 673 (1934).
[4] V. Villegas, *Philippine Agriculturist*, **19**, 229 (1930).

TABLE 1

Actual and computed salt consumption of mature female carabaos

PERIOD	NUMBER OF ANIMALS USED	AVERAGE WEIGHT	TOTAL LIVE WEIGHT	TOTAL CONSUMPTION	CONSUMPTION A KILOGRAM LIVE WEIGHT	CONSUMPTION A HEAD BASED ON AVERAGE WEIGHT
		kg.	*kg.*	*grams*	*grams*	*grams*
September 13 to September 27, 1952	10	557.75	5577.50	7166.0	1.3	713.9
September 27 to October 11	12	510.58	6126.96	8152.0	1.3	679.1
October 11 to October 25	11	514.31	5657.41	8353.0	1.5	756.0
October 25 to November 8	11	515.68	5672.48	6704.0	1.2	608.5
November 8 to November 22	10	522.25	5222.50	6439.0	1.2	642.1
November 22 to December 6	9	513.05	4617.45	4680.0	1.0	518.2
December 6 to December 20	9	527.22	4744.98	4283.0	0.9	474.5
December 20 to January 3, 1953	9	545.27	4907.43	4267.0	0.9	468.9
January 3 to January 17	9	548.16	4933.44	2953.0	0.6	323.4
January 17 to January 31	9	543.33	4889.97	2140.0	0.4	233.6
January 31 to February 14	10	544.85	5448.50	4389.0	0.8	435.9
February 14 to February 28	9	545.72	4911.48	4981.0	1.0	551.2
February 28 to March 14	9	550.61	4955.49	3899.0	0.8	429.5
March 14 to March 28	9	547.11	4923.99	4921.0	1.0	541.6
March 28 to April 11	9	550.66	4955.94	4864.0	1.0	539.6
April 11 to April 25	9	555.00	4995.00	5162.0	1.0	571.7
April 25 to May 9	9	568.88	5119.92	5121.0	1.0	568.9
May 9 to May 23	10	573.10	5731.00	5614.0	1.0	555.9
May 23 to June 6	10	563.25	5632.50	4704.0	0.8	467.5
June 6 to June 20	10	563.55	5635.50	3789.0	0.7	377.6
June 20 to July 4	13	570.19	7412.47	7426.0	1.0	570.2
July 4 to July 18	13	567.61	7378.93	5258.0	0.7	403.0
July 18 to August 1	13	564.46	7337.98	7139.0	1.0	547.5
August 1 to August 15	12	566.58	6798.96	5872.0	0.9	487.3
August 15 to August 29	12	561.83	6741.96	4274.0	0.6	354.0
August 29 to September 12	12	556.58	6678.96	5271.0	0.8	434.1
Average	—	547.98±3.80	5654.18±172.11	5300.8±297.40	0.9±.05	509.8±23.65

TABLE 2

Actual and computed salt consumption of carabao calves

PERIOD	NUMBER OF ANIMALS USED	AVERAGE WEIGHT	TOTAL LIVE WEIGHT	TOTAL CONSUMPTION	CONSUMPTION A KILOGRAM LIVE WEIGHT	CONSUMPTION A HEAD BASED ON AVERAGE WEIGHT
		kg.	*kg.*	*grams*	*grams*	*grams*
September 11 to September 25, 1952	10	151.15	1511.50	2481.0	1.6	247.9
September 25 to October 9	9	134.55	1210.95	2072.0	1.7	231.1
October 9 to October 23	9	149.22	1342.98	1784.0	1.3	197.0
October 23 to November 6	9	161.55	1453.95	1926.0	1.3	213.2
November 6 to November 20	9	132.44	1191.96	1692.0	1.4	186.7
November 20 to December 4	9	105.00	945.00	1736.0	1.8	192.2
December 4 to December 18	9	107.33	965.97	1668.0	1.7	184.6
December 18 to January 1, 1953	9	110.22	991.98	1758.0	1.7	195.1
January 1 to January 15	9	117.50	1057.50	1445.0	1.4	159.8
January 15 to January 29	9	119.27	1073.43	1907.0	1.8	211.1
January 29 to February 12	6	105.83	634.98	944.0	1.5	156.6
February 12 to February 26	6	116.66	699.96	1273.0	1.8	211.2
February 26 to March 12	6	123.16	738.96	1142.0	1.5	189.7
March 12 to March 26	6	130.25	781.50	1025.0	1.3	170.6
March 26 to April 9	6	137.83	826.98	996.0	1.2	165.4
April 9 to April 23	5	141.70	708.50	784.0	1.1	155.9
April 23 to May 7	5	155.80	779.00	746.0	1.0	148.0
May 7 to May 21	5	164.90	824.50	979.0	1.2	194.6
May 21 to June 4	5	173.00	865.00	923.0	0.7	115.9
June 4 to June 18	5	189.80	949.00	1046.0	1.1	208.8
June 18 to July 2	5	200.20	1001.00	1154.0	1.2	230.2
July 2 to July 16	5	192.70	963.50	987.0	1.0	196.6
July 16 to July 30	5	196.40	982.00	783.0	0.8	155.2
July 30 to August 13	5	199.20	996.00	893.0	0.9	177.3
August 13 to August 27	7	167.00	1169.00	886.0	0.8	125.3
August 27 to September 10	7	163.50	1144.50	818.0	0.7	116.1
Average	—	147.93±6.09	992.68±44.44	1301.8±94.90	1.3±.07	181.2±6.73

TABLE 3

Relationship of relative humidity to the moisture absorbed by salt

MONTH	RELATIVE HUMIDITY [a]	MOISTURE CONTENT OF SALT		
		Before exposure	After exposure	Absorbed from exposure
	per cent	*per cent*	*per cent*	*per cent*
September, 1952	86	13.2	37.6	24.4
October	85	12.4	34.3	21.9
November	84	12.2	29.1	16.9
December	85	12.9	36.2	23.3
January, 1953	79	11.2	33.9	22.7
February	78	11.0	15.2	4.2
March	72	10.4	19.4	9.0
April	67	8.5	9.7	1.2
May	76	8.6	13.1	4.5
June	76	11.8	30.3	18.5
July	78	12.4	35.0	12.6
August	77	11.2	23.8	12.6

[a] Taken from the meteorological observations of the Department of Agricultural Engineering, College of Agriculture.

THE ERYTHROCYTE AND LEUCOCYTE COUNTS AND HEMOGLOBIN INDEX OF THE BLOOD OF BERKJALA SWINE [1]

QUEROBIN MADRID DYCOCO

The average hemoglobin index of seven Berkjala swine was 9.6 ± 0.11 grams per 100 ml. of blood; average leucocyte count, 14.243 ± 0.481 thousand; and average erythrocyte count, 4.271 ± 0.115 million.

The leucocyte and erythrocyte counts differed significantly among the animals and between months. They were lower during the dry season than during the wet season. The hemoglobin index differed significantly among the animals but did not vary significantly during the entire year. A suggestive correlation was obtained between leucocytes and relative humidity. There was no correlation between hemoglobin index and rainfall, hemoglobin index and relative humidity, and hemoglobin index and atmospheric temperature; neither was there any correlation between leucocyte-erythrocyte counts and rainfall and between leucocyte-erythrocyte counts and atmospheric temperature.

In foreign countries the normal erythrocyte and leucocyte counts and hemoglobin index of the blood of animals are now accepted as fairly accurate guides in the diagnosis of animal diseases. The hemoglobin index is also known to be a good measure of the animal's adaptability to certain climatic conditions. The knowledge, however, can not as yet be applied to Berkjala swine in the Philippines because data on the blood of this particular breed are still lacking.

Dukes [2] reported that the hemoglobin content of swine's blood is 11.95 grams per 100 ml., the leucocyte enumeration 17,100 per ml., and the erythrocyte count 7,440,000 per ml.

Malkmus [3] stated that the normal average number of white blood corpuscles in swine is 10.0 to 20.0 thousand per ml. and that of red blood corpuscles, 5.0 to 8.0 million per ml. of blood sample.

According to Coffin,[4] swine have 9.0 to 16.8 grams of hemoglobin per 100 ml. of blood, 7.0 to 20.0 thousand leucocytes, and 5.0 to 9.0 million erythrocytes.

To determine the normal erythrocyte and leucocyte counts and hemoglobin index of the Berkjala breed of swine and to find out if these physiological features fluctuate seasonally, this study was con-

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[1] Central Experiment Station Contribution No. 1746. Thesis presented for graduation with the degree of Bachelor of Science in Agriculture from the College of Agriculture. Prepared in the Department of Animal Husbandry under the direction of Dr. Faustino S. Mensalvas and Mr. Avelino B. Manuel.

[2] H. H. Dukes, "The Physiology of Domestic Animals," Comstock Publishing Company, Inc., Ithaca, New York, pp. 21–42.

[3] B. Malkmus, "Clinical Diagnostics of the Internal Diseases of Domestic Animals," Alex Eger Inc., Chicago, pp. 288-294.

[4] D. L. Coffin, "Manual of Veterinary Clinical Pathology," Comstock Publishing Company, Inc., Ithaca, New York, 118 pp.

ducted in the Department of Animal Husbandry from January, 1953, to December, 1953.

MATERIALS AND METHODS

Two yearling boars and five gilts, all about ten months old, were given normal care and management throughout the experiment. Blood samples were taken every other week, between eight o'clock and eleven o'clock in the morning. Two cubic centimeters of blood were taken from the ear vein of each animal with a glass syringe and a hypodermic needle. Blood samples are usually taken from the jugular vein, but on account of the thick layer of fat in swine, the samples were taken from the ear vein instead. The samples were placed in vials containing an anticoagulant prepared by the Department of Agricultural Chemistry from 4 per cent potassium oxalate, 6 per cent ammonium oxalate, and 90 per cent distilled water.

The hemoglobin index was determined with a Haden-Hausser hemoglobinometer. The white pipette was filled to the 0.5 mark with blood diluted with 0.1 normal solution of hydrochloric acid. After the hemoglobin reading, the remaining unutilized blood mixture was used for the leucocyte count. In the erythrocyte determination, the red pipette and Hayem solution were used. The same counting procedure was employed for both the erythrocyte and leucocyte determinations.

The leucocyte and erythrocyte counts were taken with a microscope, a hemacytometer, and a hand tally counter. The hand tally counter registered the enumeration for every counting chamber focused under the microscope. There were four counting chambers for the leucocyte determination and five chambers for the erythrocyte determination.

Records of the atmospheric temperature, relative humidity, and rainfall from January to December, 1953, were furnished by the Department of Agricultural Engineering. The relative humidity and atmospheric temperature were the averages of what prevailed three days before and three days after the blood samples were taken; the amount of rainfall recorded was the total precipitation one week before and one week after the blood samples were taken.

RESULTS AND DISCUSSION

Hemoglobin index. The average hemoglobin indices (table 1) of the animals varied widely. When treated statistically, the differences were found significant (table 1a). On the other hand, the monthly differences were slight and more or less uniform for each animal.

The hemoglobin index did not vary in the dry season and in the wet season (table 2). The relation between hemoglobin index and

rainfall was not significant (table 4). The greatest amount of rainfall was in October, and the smallest amount was in April.

The highest relative humidity recorded was in October and the lowest, in April (table 4). The relationship of relative humidity to hemoglobin index was not significant.

With atmospheric temperature the correlation coefficient was not significant (table 4). The maximum temperature observed was in April, and the minimum in December.

There was no correlation between hemoglobin index and leucocyte count (table 4).

Leucocyte count. The variability in leucocyte count every month was significant (table 1b). There was an increase in the number of leucocytes in May, or at the start of the rainy season, but the increase was not consistent. The highest number obtained was in January, and the lowest in April. The differences between animals were not significant.

The correlation coefficient between leucocytes and relative humidity is suggestive.

No correlation was observed between leucocytes and erythrocytes. However, it may be noted in table 3 that pig No. 1330 had the widest ratio of leucocytes and erythrocytes. This would seem to indicate the presence of disease or some kind of body disturbance in the animal, and yet the pig was apparently normal.

Erythrocyte count. The highest average number of erythrocytes observed was in August, and the lowest in March (table 1c). The monthly variation of the erythrocyte enumeration was significant at 5 per cent probability level. Between animals the variation was not significant. The average erythrocyte count during the dry season was found to be lower than the average number during the wet season.

TABLE 1

Monthly means of the hemoglobin indices from January, 1953, to December, 1953, in grams per 100 ml. of blood

MONTH	HERD NUMBER						
	1245	1329	1330	1339	1338	1189	1176
January	8.5	8.0	8.5	16.0	11.0	11.0	8.0
February	9.8	9.8	8.0	9.0	10.5	11.5	8.0
March	9.5	8.8	8.0	8.8	9.8	11.0	7.8
April	9.0	8.5	10.0	9.0	10.5	14.0	9.5
May	9.0	8.8	8.0	8.3	9.8	13.5	9.8
June	8.5	11.0	8.0	8.5	10.0	11.0	12.0
July	9.5	10.0	8.5	8.8	10.5	9.5	8.5
August	9.0	10.0	8.5	9.0	10.5	10.3	8.8
September	9.8	8.8	8.5	9.8	10.0	10.5	9.0
October	9.0	9.3	9.0	10.0	10.0	11.0	9.5
November	9.8	9.0	9.0	9.3	10.0	10.0	10.5
December	8.8	8.5	8.0	9.3	9.8	11.0	11.0
Mean	9.2 ± 0.13	9.2 ± 0.28	8.5 ± 0.17	9.7 ± 0.54	10.2 ± 0.10	11.2 ± 0.37	9.4 ± 0.37

TABLE 1a

Biweekly leucocyte counts in thousands for every milliliter of blood

MONTH	HERD NUMBER							MEAN
	1245	1329	1330	1339	1338	1189	1176	
January	8.5	8.0	8.5	16.0	11.0	11.0	8.0	10.1
	—	—	—	—	—	—	—	
February	10.0	10.0	8.0	9.5	10.0	12.0	8.0	
	9.5	9.5	8.0	8.5	11.0	11.0	8.0	9.5
March	9.0	8.0	7.5	8.5	10.0	11.0	7.5	
	10.0	9.5	8.5	9.0	9.5	11.0	8.0	9.1
April	9.0	9.0	9.0	10.0	10.0	12.0	10.0	
	9.0	8.0	11.0	8.0	11.0	16.0	9.0	10.1
May	10.0	8.5	8.0	9.0	10.0	14.0	9.5	
	8.0	9.0	8.0	7.5	9.5	13.0	10.0	9.6
June	8.5	11.0	8.0	8.5	10.0	11.0	12.0	
	—	—	—	—	—	—	—	9.9
July	10.0	9.0	8.0	8.0	9.0	10.0	9.0	
	9.0	11.0	9.0	9.5	12.0	9.0	8.0	9.3
August	9.0	9.0	9.0	9.0	11.0	9.5	8.5	
	9.0	11.0	8.0	9.0	10.0	11.0	9.0	9.4
September	10.0	9.0	9.0	10.0	10.0	11.0	9.5	
	9.5	8.5	8.0	9.5	10.0	10.0	8.5	9.5
October	9.0	8.5	9.0	10.0	10.0	12.0	11.0	
	9.0	10.0	9.0	10.0	10.0	10.0	8.0	9.7
November	10.0	9.0	9.0	9.0	10.0	9.0	11.0	
	9.5	9.0	9.0	9.5	10.0	11.0	10.0	9.6
December	8.5	8.0	8.0	8.5	9.5	10.0	10.0	
	9.0	9.0	8.0	10.0	10.0	12.0	12.0	9.5
Mean	9.2	9.2	8.5	9.4	10.2	11.2	9.3	

Analysis of variance

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F-VALUE	TABULAR F-VALUE	
					5%	1%
Month (M)	11	22.99	2.09	1.15	1.94	2.54
Animal (A)	6	99.24	16.54	9.09 [a]	2.24	3.09
M × A	66	119.87	1.82			
Sampling error	70	53.75	0.77			
Total	153	295.85				

[a] Significant at 5% probability level.
L.S.M.D. (A) = .81

TABLE 1b

Biweekly erythrocyte counts in millions for every milliliter of blood

MONTH	1330	1329	1330	1339	1338	1189	1176	MEAN
January	28.000	18.350	14.050	12.550	26.500	16.950	20.750	19.593
	—	—	—	—	—	—	—	
February	33.600	37.350	22.950	18.100	17.700	8.950	23.100	
	8.300	12.900	6.150	8.300	8.800	11.300	10.850	16.311
March	14.350	4.800	11.700	5.000	6.500	11.750	4.650	
	8.700	3.650	11.900	6.550	5.900	8.350	7.100	7.921
April	11.050	5.850	7.650	5.500	4.150	5.400	6.700	
	13.300	6.050	6.750	8.200	5.950	12.300	4.050	7.350
May	13.050	7.900	10.850	3.450	14.050	17.650	15.700	
	13.500	11.150	18.650	13.650	10.200	12.100	8.000	12.136
June	10.300	24.300	19.800	9.150	10.050	15.300	19.500	
	—	—	—	—	—	—	—	15.486
July	15.100	16.300	16.950	10.950	15.150	5.800	15.250	
	19.250	14.700	20.100	19.950	14.650	15.100	15.400	15.332
August	16.450	15.100	15.650	18.600	28.400	13.100	18.550	
	22.100	15.800	14.200	17.000	9.700	14.300	25.700	17.475
September	24.100	12.850	20.400	13.500	22.750	13.800	23.050	
	20.700	9.200	10.950	14.750	16.300	13.600	14.600	16.450
October	13.400	12.450	6.050	15.200	18.700	15.350		
	18.800	14.400	9.250	15.300	15.100	14.750	17.750	14.364
November	17.000	14.450	10.050	11.600	15.100	11.100	16.400	
	18.400	12.800	8.550	13.200	13.550	13.300	13.400	13.493
December	12.750	11.750	21.450	14.900	13.750	13.700	14.250	
	17.150	21.250	32.500	20.750	20.350	21.950	19.700	18.300
Mean	16.789	13.789	14.389	12.552	14.241	12.995	14.945	

Analysis of variance

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F-VALUE	TABULAR F-VALUE 5%	TABULAR F-VALUE 1%
Month (M)	11	2990.21	271.84	15.75	1.86	2.39
Animal (A)	6	255.66	42.61	2.47	2.17	2.94
M × A	66	534.21				
Sampling error	70	1812.77	17.26			
Total	153	5592.85				

(66 + 70 = 136)

L.S.M.D. (A) = 2.47
L.S.M.D. (M) = 3.20

TABLE 1c

Biweekly hemoglobin indices for every 100 milliliters of blood

MONTH	HERD NUMBER							MEAN
	1245	1245	1329	1339	1338	1189	1176	
January	1.760	3.260	3.260	4.120	4.400	2.150	2.490	
	—	—	—	—	—	—	—	3.063
February	3.310	3.690	2.690	3.940	4.330	2.820	1.770	
	4.180	0.020	1.880	2.420	2.770	1.960	1.870	2.904
March	2.610	2.400	2.690	2.230	5.560	3.980	2.490	
	3.800	1.610	1.390	1.430	1.420	3.160	1.400	2.584
April	2.940	7.970	2.890	5.160	3.790	9.860	4.170	
	4.180	1.960	2.820	4.360	2.070	3.090	4.430	4.263
May	8.230	3.710	2.810	5.730	3.720	4.240	3.340	
	3.340	4.790	3.460	4.260	5.300	6.340	4.230	4.536
June	5.420	5.510	4.140	3.590	4.010	7.000	6.130	
	—	—	—	—	—	—	—	5.114
July	5.030	4.060	3.270	3.510	5.310	2.380	3.600	
	4.950	9.3500	4.240	5.120	6.080	1.140	6.320	4.597
August	4.210	10.020	4.940	2.840	5.030	6.400	7.670	
	5.640	12.020	6.630	3.330	10.590	6.290	3.730	6.381
September	4.050	4.860	4.320	4.890	4.340	5.870	5.220	
	4.210	4.010	6.340	8.550	5.750	6.680	3.790	5.206
October	4.970	3.700	2.400	3.470	5.860	6.300	3.770	
	3.370	4.540	2.710	5.190	—	3.220	3.530	4.037
November	—	—	—	—	3.490	—	—	
	3.780	3.320	3.690	5.660	4.140	4.330	3.810	4.104
December	4.060	3.840	3.470	3.750	5.180	4.180	3.270	
	4.990	3.970	3.030	3.650	4.210	5.590	5.610	4.200
Mean	4.240	4.839	3.480	4.152	4.636	4.618	3.935	

Analysis of variance

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	COMPUTED F-VALUE	TABULAR F-VALUE 5%	TABULAR F-VALUE 1%
Month (M)	11	194.14	17.65	8.17 [a]	1.86	2.40
Animal (A)	6	27.93	4.66	2.16 [a]	2.17	2.95
M × A	66	126.29	2.16			
Sampling error	63 } 129	151.88				
Total	146					

[a] Significant at 5% probability level.
L.S.M.D. (M) = 1.17
L.S.M.D. (A) = .89

TABLE 2

Seasonal variation of the monthly means of hemoglobin index and leucocyte and erythrocyte counts

SEASON	MONTH	HEMOGLOBIN INDEX	LEUCOCYTES	ERYTHROCYTES
		grams/100 ml.	*thousands/ml.*	*millions/ml.*
Dry	January	10.1	19.593	3.063
	February	9.5	16.311	2.904
	March	9.1	7.921	2.584
	April	10.1	7.350	4.263
Mean		9.7	12.794	3.204
Wet	May	9.6	12.136	4.536
	June	9.9	15.486	5.114
	July	9.3	15.332	4.597
	August	9.4	17.475	6.381
	September	9.5	16.450	5.206
	October	9.7	14.364	4.037
	November	9.6	13.493	4.104
	December	9.5	18.300	4.200
Mean		9.6	15.3795	4.772

TABLE 3

Yearly hemoglobin index and leucocyte and erythrocyte counts of Berkjala swine

HERD NUMBER	HEMOGLOBIN INDEX	LEUCOCYTES	ERYTHROCYTES
	grams/100 ml.	*thousands/ml.*	*millions/ml.*
1245	9.2 ± 0.13	16.789 ± 1.547	4.240 ± 0.385
1329	9.2 ± 0.28	13.789 ± 1.638	4.839 ± 0.616
1330	8.5 ± 0.17	14.389 ± 1.543	2.897 ± 0.343
1339	9.4 ± 0.54	12.552 ± 1.206	4.149 ± 0.406
1338	10.2 ± 0.10	14.241 ± 1.508	4.636 ± 0.472
1189	11.2 ± 0.37	12.995 ± 1.047	4.618 ± 0.518
1176	9.3 ± 0.37	14.945 ± 1.418	3.935 ± 0.405
Mean	9.6 ± 0.11	14.243 ± 0.481	4.271 ± 0.115

TABLE 4

Hemoglobin indices, red blood cells, and white blood cells of Berkjala swine and atmospheric temperature, relative humidity, and rainfall from January, 1953, to December, 1953

	HEMOGLOBIN	WHITE BLOOD CELLS	RED BLOOD CELLS	TEMPERATURE	HUMIDITY	RAINFALL
	grams/100 ml.	*thousands/ml.*	*millions/ml.*	*°C.*	*per cent*	*inches*
January	10.14	19.593	3.050	25.2	83.2	0.18
	—	—	—	25.9	76.5	3.54
February	9.64	23.107	3.221	26.5	79.1	0.93
	9.36	9.514	2.586	25.9	80.0	1.67
March	8.75	14.371	3.137	28.3	72.2	0.25
	9.36	7.450	2.030	26.2	67.5	0.66
April	986	6.614	5.281	30.0	65.1	
	10.29	13.292	3.316	29.4	70.8	0.05
May	9.86	11.807	4.540	29.4	77.5	3.78
	9.26	12.464	4.531	29.5	79.6	7.34
June	9.86	15.486	5.114	26.9	68.8	1.73
	—	—	—	26.9	74.4	3.64
July	9.00	13.643	4.748	28.3	75.2	5.21
	9.64	17.021	5.314	26.5	81.1	4.41
August	9.26	17.979	5.873	27.6	78.3	8.53
	9.57	16.929	6.976	27.7	76.2	2.68
September	9.79	19.214	4.793	28.0	77.3	1.83
	9.14	14.264	5.707	27.3	80.7	3.17
October	9.93	13.679	4.353	26.5	89.6	2.10
	9.43	14.764	3.721	26.6	89.6	11.13
November	9.57	13.671	—	27.8	77.7	3.62
	9.71	12.600	4.104	27.0	81.1	8.25
December	8.93	14.621	3.964	23.5	89.1	5.35
	10.00	19.379	4.436	25.1	84.7	1.86

Summary of correlation coefficients of hemoglobin index, leucocytes, erythrocytes, relative humidity, atmospheric temperature, and rainfall

ITEM	DF	COMPUTED r	TABULAR r	
			5%	1%
Hemoglobin index and rainfall	19	−0.320	0.433	0.549
Hemoglobin index and relative humidity	20	−0.060	0.423	0.537
Hemoglobin index and atmospheric temperature	20	+0.092	0.423	0.537
Hemoglobin index and leucocytes	20	+0.119	0.423	0.537
Leucocytes and rainfall	19	−0.091	0.433	0.549
Leucocytes and relative humidity	20	+0.402[a]	0.423	0.537
Leucocytes and temperature	20	−0.343	0.423	0.537
Leucocytes and erythrocytes	19	+0.198	0.433	0.549
Erythrocytes and rainfall	18	+0.167	0.444	0.561
Erythrocytes and relative humidity	19	+0.157	0.433	0.549
Erythrocytes and atmospheric temperature	19	+0.276	0.433	0.549

[a] Suggestive.

COLLEGE AND ALUMNI NOTES

The United States congressional party which came to Southeast Asia on a fact-finding political and economic survey visited the College on December 10. The party was composed of Representative Walter E. Judd, head of the group, and Representatives Marguerite Church, E. Ross Adair, Clement J. Zablocki, and Albert G. F. Westphall. Among those with the partv were Director Harrv A. Brenn, Dr. Leland E. Call, and other FOA and US Embassy officials. The visitors were received at the Home Technology Building by Dean L. B. Uichanco and faculty members.

Dean L. B. Uichanco was awarded a plaque by the Philippine Association for the Advancement of Science in recognition of his outstanding accomplishment in the field of entomology. The award was made during the dinner dance of the Association on the evening of December 5.

Mr. Claude F. Clayton and Mr. Dimas Maulit, '29, discussed the organization and function of the Office of Agricultural Economics in the DANR at the seminar in agricultural economics held on December 9. Mr. Maulit is head of the office and Mr. Clayton is FOA adviser on economic matters.

Mrs. Mercedes A. Uichanco, president of the Maquiling Ladies' Club, was guest speaker at the UP Rural High School convocation on December 4 in connection with the observance of Family Week.

What can be considered as the best attended affair of the year, with the exception of the Loyalty Dav celebration, was the program presented by the faculty on the evening of December 4 in honor of the Cornell group. The medley of Philippine airs sang by the younger faculty members in native costumes drew the most applause. The plav, "Suppressed Desire," was superbly presented. Other numbers were a piano selection, a declamation in Spanish, a vocal rendition, harmonica selections, and a folk dance. Prof. Montgomery E. Robinson spoke for the Cornell group and Dean L. B. Uichanco gave the closing remarks.

The faculty held a party on the afternoon of December 17 in connection with the completion of the faculty clubhouse. The principal features were community singing of Christmas carols, an impromptu program, and dancing. Dr. Antonio G. Tan is the president of the Faculty Club.

The Upsilon Sigma Phi, one of the student fraternities on the campus, had its "barrio fiesta" on the evening of December 12. Mr. Francisco Ascalon is the Illustrious Fellow of the fraternity and Dr. F. T. Orillo, the adviser.

Mr. Edilberto Reyes, a UP graduate in chemistry, joined the Department of Soils on November 16 as research assistant to Dr.

N. C. Brady. He turned benedict on December 17 when he married the former Miss Aida Raymundo.

Mr. Jose T. Tapay, '45, is assistant cane breeder at the PHILSUGIN experiment station in La Carlota, Negros Occidental. He was formerly with the Bureau of Plant Industry.

Mr. Pedro A. Abella, '47, is an instructor in the Central Luzon Agricultural College, Nueva Ecija. He was formerly connected with the Araneta Institute of Agriculture.

Mr. Gregorio S. Gascon, '47, is with the Philippine Army settlement project in Kapatagan, Lanao. He was formerly assistant director of physical education in the College.

Mr. Candido V. Rosario, '49, is teaching at the Nueva Vizcaya High School in Bayombong.

Mr. Jainari S. Kibtiani, '50, is principal of Siasi Academy in Sulu. He was formerly teaching at Lapak Agricultural High School.

Mr. Florante C. Salvador, '50, is connected with the Shell Company of the Philippines, with headquarters in Iloilo City. He was formerly teaching agriculture at the Morong High School in Rizal.

Mr. Donato C. Azman, '52, is soil technologist at the Bureau of Soil Conservation.

Mr. Bonifacio B. Manuel, '53, is teaching agriculture at the Camiling Rural High School in Tarlac.

US Vice-President Richard Nixon wrote the Dean to express his appreciation and that of Mrs. Nixon for all that was done to make their recent visit to the College enjoyable. "We certainly enjoyed our visit and hope you will convey our thanks to the faculty members who assisted you in the excellent arrangements which were made for our tour," Vice-President Nixon wrote.

Dr. E. B. Copeland extended his greetings and best wishes for the holidays and the coming year to Dean Uichanco and his personal and official families.

Dean Jose E. Velmonte, of the UP College of Business Administration, was the speaker at the seminar of the Department of Agricultural Economics on December 16, 1953. He was formerly head of this department.

Mr. F. A. McClure, bamboo specialist of the US Department of Agriculture, and Prof. Jose Vera Santos, of the UP Department of Botany, were campus visitors on December 9, 1953.

Mr. Abhai Chandavimol, Mr. Subin Phinpayachen Liu, Mr. Sanong Sooksman, of the Ministry of Education, Bangkok; Mr. Kasem Udyanin, of Chulalongkorn University, Bangkok; Mr. C. Pumahitananda and Mr. Kaw Swasdi Panish, accompanied by Mr. Phanom Smitananda, '35, of the Educational Pilot Project, Thailand; and Mr. Edgar B. Cale, of Philadelphia, Pennsylvania, USA, visited the College on December 12, 1953.

Miss Mabel Warnecke, of Lexington, Kentucky, and Mr. Ray E. Davis, of FOA, Manila, were on the campus on December 15, 1953.

Prof. and Mrs. H. Ray Bell, of Silliman University, Dumaguete City, were campus visitors last December 22. They were accompanied by Dean Leland E. Call, FOA.

The student body organization of the College had its Christmas celebration on December 18, 1953. The affair consisted of a lantern-torch parade, a lantern contest, community singing, and a weenie roast.

The freshman class organization of the College sponsored a Christmas get-together and dance on the evening of December 23, 1953, for the students who spent their Christmas vacation on the campus.

The UP Rural High School student body organization presented a Christmas program last December 16; main features were competitions in skit presentations and singing of Christmas carols among the different classes.

The Maquiling School children presented a Christmas program on December 18, 1953, featuring the operetta, "Gift of Christmas." Other numbers included choruses, recitations, a playlet, folk dances, and a piano duet. Christmas gifts donated by the Maquiling Ladies' Club and student organizations were distributed among the children.

Dr. Bienvenido Ma. Gonzalez, '13, was laid in his final resting place at the South Cemetery in Makati, Rizal, on Thursday afternoon, December 31, 1953. He died of heart failure on Wednesday noon, December 30, at the San Juan de Dios Hospital. He served the University first as assistant in animal husbandry in 1913. He became head of the Department of Animal Husbandry in 1920, dean of the College of Agriculture in 1928, and president of the University in 1939. He resigned during the Japanese regime, but was reappointed by President Osmeña in 1945. He served up to 1951, when he retired following a disagreement with the President of the Philippines regarding University policies.

Mr. Eligio J. Tavanlar, '26, was recently appointed acting chairman of the board of directors of the LASEDECO. He served as chairman of the committee to study the operation of the NASSCO.

Col. Osmundo Mondoñedo, '35, is a member of the budgetary committee appointed by President Magsaysay. He was also appointed member of the committee to investigate the conditions of the PAL.

Mr. Feliciano B. Serrano, '19, of the Bureau of Plant Industry, was a member of the committee created by President Magsaysay to study the rice problem.

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